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PARALLAX OF α LYRÆ AND 61 CYGNI.

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REAR-ADMIRAL JOHN RODGERS, U. S. NAVY,

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INTRODUCTION.

In the year 1862 a series of observations of α *Lyræ* was begun at the Naval Observatory by Prof. J. S. HUBBARD, for the purpose of determining the annual parallax of this star, and also for obtaining new values of the constants of aberration and nutation. These observations were determinations of the declination of the star with the Prime Vertical Transit Instrument according to the method followed by W. STRUVE. The work was continued by Professor HUBBARD until his death, in 1863; and afterward by Professors NEWCOMB, HARKNESS, and myself until April, 1867. An examination of these observations was made by Professor CLEVELAND ABBE in the latter part of the year 1867, when it became apparent that a negative value of the parallax would result, a fact indicating some systematic error in the work. Although the parallax of this star has been determined by several astronomers, still, considering the above failure, it seemed worth while to make an attempt by the differential method while the Naval Observatory remains on its present site. Moreover, the parallaxes of the fixed stars being very small quantities, which have a period of a year, during which the observer and his instruments undergo great changes of temperature, the determination of the parallax of any star by a new observer with a new instrument, and under different climatic conditions, is not, I think, a superfluous work. I began, therefore, a series of observations of α *Lyræ* on May 24, 1880, which was ended on July 2, 1881; observations having been made on 77 nights. As the interesting double star, 61 *Cygni* could also be observed without spending much more time, a similar series of observations of this star was begun on October 24, 1880, and ended December 7, 1881. This star was observed on 66 nights. The observations were not made on every clear night, my purpose being to obtain only data enough to give trustworthy values of the parallax; but even with this limitation these observations have taken much more time than I expected. My house is distant about one mile from the Observatory, and frequently during the winter and spring months on reaching the Observatory I would find the images so bad that no measurements for parallax could be made, or the sky would become covered with clouds. During the spring months, when the observations came at an inconvenient hour of the night, General HAZEN, of the Signal Office, very kindly sent me predictions of the weather which proved to be remarkably correct.

I am indebted to Mr. G. ANDERSON for faithful assistance during all this work.

These observations have been made with the filar micrometer of the 26-inch refractor, and an achromatic eye-piece, giving a magnifying power of 383, has been used throughout. On some of the nights the images would have borne a higher power,

but, as the work was differential, the eye-piece was not changed. Since observations of the angle of position made with the circle of our micrometer are less accurate for distances that must be used in determinations of parallax, I have observed simply the difference of declination of α *Lyrae* and its companion of the 10th magnitude. In the case of 61 *Cygni* the difference of declination of the smaller of these stars and a star of the 9.5 magnitude, about $3'.3$ south of the double star, was observed. This star is D. M. $+38^\circ$, No. 4345. The observations were made in the following manner: After the stellar focus of the telescope had been adjusted by examining a close double star with a high power, and the parallel of the wires had been carefully determined, the telescope was clamped in declination, the driving clock was put in, and the stars were placed so that they were equidistant from the center of the field in declination and midway in right ascension. Five bisections and readings for the difference of declination were made in the first position of the wires, then the wires were reversed and five more bisections were made. These ten readings having been made, the micrometer was reversed 180° , and a similar set was made in this position of the micrometer; the wires at the end of the work being restored to their first position. In making these bisections both screws were turned several revolutions after each reading, in order to render the single measurements independent of each other. The sidereal clock and the thermometer in the dome were read at the beginning and at the end of the bisections. After finishing the observation the driving clock was thrown out and the parallel of the wires was examined by the star observed for the purpose of detecting any erroneous setting of the position circle. This programme was strictly followed in all the observations except in the first observation of α *Lyrae*, on May 24, 1880, when only four bisections were made in each position of the wires; but as the images were unusually good on that day I have considered this as a normal observation. In the observations of α *Lyrae* two kinds of illumination were used, the bright wires being denoted by *B* and the dark wires with a bright field by *A*. For 61² *Cygni* only the dark wires were used.

The following are the observations of these stars that I have made during the past eighteen months. All the readings of the micrometer are given, only a few incomplete observations being omitted, where the work was interrupted by clouds and which can give no results. An examination of the observations will show that a few cases occur where it is probable that an error of a tenth of a revolution was made in reading the head of the micrometer, but I have not ventured to make any change, since in most of these cases the images were poor, and the apparently erroneous readings are within the limits of possible error. Most of the quantities in the following table will be understood from the headings of the columns, and these need no explanation. The differences of declination given in the column $\Delta\delta$ have been computed from the quantities of the preceding column by the equation

$$\frac{1}{2} R = 4''.9737$$

The column $\Delta\rho$ contains the corrections for differential refraction. The principal part of this correction has been computed from the formula

$$\Delta\rho = \Delta\delta.k(\tan z^2 \cos q^2 + 1)$$

where z is the zenith distance, q the parallactic angle, and the factor k , expressed in parts of radius, serves for the mean condition of the thermometer and barometer. Generally this quantity is of the form

$$k = \alpha \beta^\lambda \gamma^\lambda,$$

where the factors that multiply α depend on the thermometer and barometer; and in our case these factors differ but little from unity. The first of the following tables gives the correction for differential refraction under the assumption

$$k = \alpha,$$

and the second table gives the factor by which this correction is to be multiplied in order to give the correction corresponding to the actual state of the thermometer and barometer.

TABLE I for $\Delta\rho$.

$$k = \alpha.$$

Hour Angle.		Hour Angle.		α Lyrae.	61 ² Cygni.
h.	m.	h.	m.	"	"
0	0	24	0	+ 0.012	+ 0.056
0	20	23	40	0.012	0.056
0	40	23	20	0.012	0.056
1	0	23	0	0.012	0.056
1	20	22	40	0.012	0.056
1	40	22	20	0.012	0.056
2	0	22	0	0.012	0.056
2	20	21	40	0.013	0.057
2	40	21	20	0.013	0.057
3	0	21	0	0.013	0.058
3	20	20	40	0.013	0.059
3	40	20	20	0.013	0.061
4	0	20	0	0.014	0.063
4	20	19	40	0.015	0.067
4	40	19	20	0.016	0.073
5	0	19	0	0.018	0.081
5	20	18	40	0.021	0.093
5	40	18	20	+ 0.025	+ 0.108

TABLE II for $\Delta\rho$.

Therm.	Barometer.	
	26 ⁱⁿ .6.	30 ⁱⁿ .6.
°		
0	1.11	1.15
10	1.08	1.12
20	1.06	1.10
30	1.04	1.07
40	1.02	1.05
50	1.00	1.03
60	0.98	1.01
70	0.96	0.99
80	0.94	0.97
90	0.92	0.95

The weights given in the next column depend only on the condition of the images, and were estimated at the time of observation. In the column of "Remarks" the kind of illumination is distinguished for the observation of α *Lyrae*, and the notes of the observer recorded at the time of the observations are also given. Then are given the mean time of the observation, the mean values of the difference of declination, the adopted correction for differential refraction, and the probable error of a single difference of declination, this value of the error being deduced from the work of each night.

Observations of α Lyræ and Companion.

Date.	Clock Time	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
	h. m.	h. m.		r.	r.	r.				
1887 May 24				59.678	68.533	8.855	44.04		4	Ill. A.
				.689	.539	.850	44.02			
				.688	.531	.863	44.08			
		22 6.3		59.681	68.559	.878	44.16	+ 0.012		$\tau = 12^h 26^m.5$
				68.551	59.678	.875	44.14			$\Delta\delta = 44''.122$
				.539	.672	.867	44.10			$\Delta\rho = + 0''.012$
				.554			44.23			$r_1 = \pm 0''.051$
			73.2	.555	.667	.888	44.21			
May 25	16 27	22 2.1	77.0	59.638	68.567	8.929	44.41	+ 0.012	2	Ill. A.
				.641	.571	.930	44.42			
				.638	.545	.907	44.30			
					.543	.883	44.18			
				59.681	68.536	.855	44.04			$\tau = 12^h 19^m.9$
				68.534	59.668	.866	44.10			$\Delta\tau = 44''.100$
				.539	.662	.877	44.15			$\Delta\rho = + 0''.012$
				.532	.625	.907	44.30			$r_1 = \pm 0''.100$
				.532	.679	.853	44.03			
		22 16.2		.540	.682	.858	44.06	+ 0.012		
May 26	16 16	21 40.2	78.0	59.664	68.517	8.853	44.03	+ 0.012	2	Ill. A.
				.635	.543	.908	44.31			
					.579	.919	44.36			
				.650	.540	.890	44.22			
				59.676	68.550	.874	44.14			$\tau = 12^h 17^m.0$
				68.532		.852	44.03			$\Delta\delta = 44''.185$
				.529	.641	.888	44.21			$\Delta\rho = + 0''.012$
				.540	.637	.903	44.28			$r_1 = \pm 0''.074$
				.520	.647	.873	44.13			
			76.5	.528		.874	44.14	+ 0.012		
May 27	15 33	20 57.1	75.0	59.700	68.580	8.880	44.17	+ 0.013	2	Ill. B.
				.679	.556	.877	44.15			
				.633	.535	.902	44.28			
				.670	.579	.900	44.31			
				59.688	68.579	.891	44.22			$\tau = 11^h 21^m.6$
				68.494	59.609	.885	44.19			$\Delta\delta = 44''.242$
				.542	.640	.902	44.28			$\Delta\rho = + 0''.013$
				.548		.888	44.21			$r_1 = \pm 0''.041$
				.552	.641	.911	44.32			
		21 29.1	74.5	.553		.905	44.29	+ 0.013		
May 27	16 29	21 53.1	73.6	59.670	68.562	8.892	44.13	+ 0.012	2	Ill. A.
				.664	.550	.843	44.24			
				.715	.521	.806	43.80			
				.654	.535	.881	44.17			
				59.637	68.553	.916	44.35			$\tau = 12^h 13^m.0$
				68.543	59.632	.911	44.32			$\Delta\delta = 44''.168$
				.539	.660	.879	44.16			$\Delta\rho = + 0''.012$
				.534	.639	.895	44.24			$r_1 = \pm 0''.118$
				.561	.605	.896	44.25			
		22 16.1	73.2	.509	.679	.830	43.92	+ 0.012		
May 28	15 23	20 36.0	72.0		68.556	8.906	44.30	+ 0.013	2	Ill. B.
				.671	.575	.904	44.29			
				.675	.550	.875	44.14			
				.685	.554	.869	44.11			
				59.623	68.550	.927	44.40			$\tau = 11^h 5^m.8$
				68.552	59.687	.865	44.09			$\Delta\delta = 44''.212$
				.540	.669	.871	44.12			$\Delta\rho = + 0''.013$
				.561	.666	.895	44.24			$r_1 = \pm 0''.091$
				.559	.630	.929	44.41			
		16 5	71.5	.521	.671	.850	44.02	+ 0.013		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.		Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880. May 31	h. m.		h. m.			r.	r.	r.	"	"		
	16 7		21 31.0		71.5	59.686	68.559	.873	44.13	+ 0.013	2	III. A.
						.658	.531	.873	44.13			
						.671	.563	.892	44.23			
						.657	.553	.896	44.25			
						59.634	68.548	.914	44.34			$\tau = 11^h 36^m.2$
						68.551	59.683	.868	44.11			$\Delta\delta = 44''.201$
						.563	.666	.897	44.25			$\Delta\rho = + 0''.013$
						.541	.653	.888	44.21			$r_1 = \pm 0''.047$
						.550	.665	.885	44.19			
	16 32		21 56.0		71.0	.539	.659	.880	44.17	+ 0.012		
June 2	15 50		21 13.2		55.8	68.587	59.660	8.927	44.40	+ 0.013	2	III. B.
						.579	.617	.962	44.57			
						.574	.652	.922	44.38			
						.573	.660	.913	44.33			
						68.580	59.644	.936	44.44			$\tau = 11^h 13^m.6$
						59.653	68.549	.896	44.25			$\Delta\delta = 44''.333$
						.649	.551	.902	44.28			$\Delta\rho = + 0''.013$
						.634	.570	.936	44.44			$r_1 = \pm 0''.098$
						.663	.527	.864	44.09			
	16 21		21 44.2		55.0	.648	.525	.877	44.15	+ 0.013		
June 2	16 34		21 47.2		55.0	68.510	59.651	8.859	44.06	+ 0.013	2	III. A.
						.533	.693	.840	43.97			
						.537	.682	.855	44.04			
						.567	.657	.910	44.32			
						68.564	59.658	.906	44.30			$\tau = 11^h 48^m.0$
						59.662	68.538	.876	44.15			$\Delta\delta = 44''.161$
						.685	.549	.864	44.09			$\Delta\rho = + 0''.013$
						.662	.526	.864	44.09			$r_1 = \pm 0''.088$
						.668	.569	.901	44.27			
	16 56		22 19.2		54.7	.649	.560	.911	44.32	+ 0.013		
June 17	16 20		21 47.1		68.5	68.552	59.675	8.877	44.15	+ 0.012	2	III. A.
						.533	.670	.863	44.08			
						.548	.678	.870	44.12			
						.545	.701	.844	43.99			
						68.560	59.666	.894	44.24			$\tau = 10^h 44^m.4$
						59.698	68.505	.807	43.80			$\Delta\delta = 44''.060$
						.671	.524	.853	44.03			$\Delta\rho = + 0''.012$
						.669	.513	.844	43.99			$r_1 = \pm 0''.085$
						.699	.548	.849	44.01			
	16 43		22 10.1		68.5	.646	.530	.884	44.19	+ 0.012		
June 18	16 22		21 49.1		71.0	68.540	59.663	8.877	44.15	+ 0.012	2	III. A.
						.521	.637	.884	44.19			
						.511	.669	.842	43.98			
						.555	.649	.906	44.30			
						68.545	59.623	.922	44.38			$\tau = 10^h 54^m.5$
						59.648	68.522	.874	44.14			$\Delta\delta = 44''.146$
						.670	.531	.861	44.07			$\Delta\rho = + 0''.012$
						.683	.540	.857	44.05			$r_1 = \pm 0''.099$
						.699	.529	.830	43.92			
	17 9		22 36.1		69.8	.639	.542	.903	44.28	+ 0.012		
June 21	16 31		21 58.0		77.0	68.562	59.628	8.934	44.44	+ 0.011	2	III. A.
						.531	.654	.877	44.15			
						.539	.656	.883	44.18			
						.545	.697	.848	44.01			
						68.563	59.661	.902	44.28			$\tau = 10^h 41^m.1$
						59.679	68.539	.860	44.07			$\Delta\delta = 44''.165$
						.659	.560	.901	44.27			$\Delta\rho = + 0''.011$
						.682	.527	.845	43.99			$r_1 = \pm 0''.099$
						.656	.554	.898	44.26			
	16 57		22 24.0		77.0	.681	.528	.847	44.00	+ 0.011		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Count	Hour Angle.	Temp.	Micr.	Micr.	δ	$\Delta\delta$	$\Delta\rho$	Wt	Remarks.
1880. June 22	h. m. 16 15	h. m. 22 15.9	77.5	r. 68.554 .556 .531 .562 59.647 .659 .667 .658 .680	r. .660 .681 .676 59.691 68.557 .566 .572 .562 .548	r. 8.884 .896 .850 .850 .871 .910 .907 .905 .904 .868	44.19 44.25 44.02 44.02 44.12 44.32 44.30 44.29 44.29 44.11	+ 0.011	3	Ill. B. $\tau = 10^h 52^m.0$ $\Delta\delta = 44''.191$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.078$
June 22	17 9	22 35.9	76.2	68.569 .543 .543 .546 68.575 59.660 .673 .680 .670 .705	59.642 .670 .689 .650 59.681 68.544 .539 .580 .554 .534	8.927 .873 .854 .896 .894 .884 .866 .900 .884 .829	44.40 44.13 44.04 44.25 44.24 44.19 44.10 44.27 44.19 43.91	+ 0.011	3	Ill. A. $\tau = 11^h 15^m.9$ $\Delta\delta = 44''.172$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.092$
June 23	16 4	21 30.8	80.0	68.569 .570 .557 .547 68.572 59.669 .642 .660 .678 .681	59.658 .652 .640 .665 59.669 68.554 .552 .559 .580 .530	8.911 .918 .917 .882 .903 .934 .910 .899 .902 .849	44.32 44.36 44.35 44.18 44.28 44.43 44.32 44.26 44.28 44.11	+ 0.011	2	Ill. B. $\tau = 10^h 7^m.1$ $\Delta\delta = 44''.279$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.078$
June 23	16 35	22 1.8	79.0	68.542 .572 .546 .553 68.518 59.672 .654 .675 .635 .661	59.667 .687 .654 .649 59.688 68.554 .565 .556 .569 .541	8.875 .885 .892 .904 .830 .882 .911 .881 .934 .880	44.14 44.19 44.11 44.20 43.92 44.18 44.32 44.17 44.43 44.17	+ 0.011	3	Ill. A. $\tau = 11^h 37^m.0$ $\Delta\delta = 44''.204$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.078$
June 24	16 39	22 5.7	82.0	68.536 .550 .527 .549 68.521 59.631 .648 .638 .651 .650	59.667 .662 .650 .639 59.644 68.587 .563 .554 .530 .554	8.869 .888 .877 .910 .877 .956 .915 .916 .879 .904	44.11 44.21 44.15 44.32 44.15 44.54 44.34 44.35 44.16 44.29	+ 0.011	3	Ill. B. Clouds. $\tau = 10^h 35^m.0$ $\Delta\delta = 44''.262$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.089$
June 26	16 6	21 32.5	76.0	68.531 .536 .552 .530 68.532 59.651 .631 .625 .654 .638	59.638 .608 .597 .591 59.629 68.539 .562 .590 .619 .565	8.893 .928 .955 .911 .903 .888 .931 .965 .965 .927	44.23 44.40 44.54 44.46 44.28 44.21 44.42 44.59 44.59 44.40	+ 0.012	2	Ill. B. Clouds. $\tau = 9^h 59^m.6$ $\Delta\delta = 44''.412$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.094$

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880. June 27	h. m. 15 45	h. m. 21 11.4	° 81.8	r. 68.550	r. 59.640	r. 8.910	" 44.32	" + 0.012	3	Ill. A.
				.531	.666	.865	44.09			
				.546	.661	.885	44.19			
				.531	.620	.911	44.32			
	— 0 ^m .7			68.531	59.640	.891	44.22			$\tau = 9^h 30^m.0$
				59.657	68.528	.871	44.12			$\Delta\delta = 44''.189$
				.678	.517	.839	43.96			$\Delta\rho = + 0''.012$
				.651	.540	.889	44.21			$r_1 = \pm 0''.074$
				.654	.540	.886	44.20			
	16 9	21 35.4	81.0	.602	.501	.899	44.26	0.012		
June 28	16 8	21 34.3	80.8	68.546	59.666	8.880	44.17	+ 0.012	3	Ill. A.
				.510	.652	.858	44.06			
				.554	.659	.895	44.24			
				.509	.640	.869	44.11			
	— 0 ^m .8			68.513	59.665	.848	44.01			$\tau = 9^h 46^m.9$
				59.660	68.526	.866	44.10			$\Delta\delta = 44''.132$
				.644	.564	.920	44.36			$\Delta\rho = + 0''.012$
				.675	.514	.839	43.96			$r_1 = \pm 0''.101$
				.637	.555	.918	44.36			
	16 28	21 54.3	80.5	.684	.520	.836	43.95	+ 0.012		
June 28	16 31	21 57.3	80.5	68.569	59.651	8.918	44.36	+ 0.011	3	Ill. B.
				.540	.678	.862	44.08			
				.530	.705	.825	43.89			
				.573	.668	.905	44.29			
	— 0 ^m .8			68.572	.662	.910	44.32			$\tau = 10^h 57^m.2$
				59.630	68.542	.912	44.33			$\Delta\delta = 44''.230$
				.649	.550	.901	44.27			$\Delta\rho = + 0''.011$
				.673	.531	.858	44.06			$r_1 = \pm 0''.109$
				.633	.551	.918	44.35			
	16 51	22 17.3	80.0	.639	.555	.916	44.35	+ 0.011		
June 30	16 22	21 48.1	76.8	68.519	59.660	8.859	44.06	+ 0.011	2	Ill. A.
				.553	.659	.894	44.24			
				.578	.636	.942	44.48			
				.555	.652	.903	44.28			
	— 1 ^m .0			68.552	59.660	.892	44.23			$\tau = 9^h 55^m.3$
				59.685	68.550	.865	44.09			$\Delta\delta = 44''.209$
				.670	.503	.833	43.93			$\Delta\rho = + 0''.011$
				.639	.545	.906	44.30			$r_1 = \pm 0''.103$
				.656	.562	.906	44.29			
	16 47	22 13.1	76.0	.664	.548	.884	44.19	+ 0.011		
June 30	16 52	22 18.1	76.0	68.585	59.672	8.913	44.31	+ 0.011	2	Ill. B.
				.586	.660	.926	44.40			
				.575	.666	.909	44.31			
				.587	.660	.927	44.40			
	— 1 ^m .0			68.581	59.650	.931	44.42			$\tau = 10^h 26^m.7$
				59.627	68.556	.929	44.41			$\Delta\delta = 44''.338$
				.650	.569	.919	44.36			$\Delta\rho = + 0''.011$
				.666	.565	.899	44.26			$r_1 = \pm 0''.049$
				.643	.531	.888	44.21			
	17 20	22 46.1	75.0	.651	.553	.902	44.28	+ 0.011		
July 3	16 26	21 51.9	72.5	68.558	59.640	8.918	44.35	+ 0.011	3	Ill. B.
				.520	.662	.858	44.06			
				.548	.668	.880	44.17			
				.531	.680	.851	44.02			
	— 1 ^m .2			68.550	.659	.891	44.22			$\tau = 9^h 48^m.8$
				59.647	68.576	.929	44.41			$\Delta\delta = 44''.243$
				.640	.539	.899	44.26			$\Delta\rho = + 0''.011$
				.661	.590	.929	44.41			$r_1 = \pm 0''.089$
				.668	.568	.900	44.27			
	16 54	22 19.9	71.7	.669	.568	.899	44.26	+ 0.011		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	α	δ	μ	M	Remarks.
1880. July 3	h. m. 10 35	h. m. 22 22.9	71.7	68.537 .542 .549 .556	r. 59.640 .678 .655 .656	r. 8.897 .864 .885 .900	44.00 44.00 44.00 44.27	+ 0.011	3	III. A. $\Delta\delta = 44''.145$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.095$
	10 35	22 47.9	70.9	68.576 59.682 .642 .686 .686	59.681 68.531 .566 .542 .524 .886	.895 .849 .924 .862 .838 .842	44.24 44.01 44.38 44.08 43.96 43.98	+ 0.011		
July 26	16 14	21 38.0	82.5	68.551 .527 .550 .548	59.656 .660 .664 .653	8.895 .867 .886 .895	44.24 44.10 44.20 44.24		2	III. B. $\tau = 8^h 4^m.0$ $\Delta\delta = 44''.101$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.067$
	— 3 ^{m.1}			68.535 59.660 .670 .649 .659	59.657 68.524 .550 .543 .577	.878 .864 .880 .894 .918	44.16 44.09 44.17 44.24 44.36			
	16 41	22 5.0	81.8	.700	.548	.848	44.01	+ 0.011		
July 27	17 5	22 28.9	76.6	68.510 .543 .542 .551	59.664 .675 .670 .680	8.846 .868 .872 .871	44.00 44.10 44.13 44.12	+ 0.011	2	III. A. $\tau = 8^h 45^m.$ $\Delta\delta = 44''.101$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.057$
	— 3 ^{m.2}			68.530 59.640 .669 .648 .660	59.643 68.509 .531 .543 .520	.887 .869 .862 .895 .860	44.20 44.11 44.08 44.24 44.07			
	17 21	22 44.9	76.0	.693	.529	.836	43.95	+ 0.011		
July 28	16 33	21 56.8	74.8	59.669 .661 .649	68.549 .560 .551	8.880 .899 .864	44.17 44.26 44.09	+ 0.011	2	III. B. $\tau = 8^h 13^m.4$ $\Delta\delta = 44''.225$ $\Delta\rho = + 0''.004$ $r_1 = \pm 0''.072$
	— 3 ^{m.3}			59.666 68.561 .536 .560 .538	68.546 59.630 .671 .657 .657	.880 .911 .865 .903 .878	44.17 44.42 44.09 44.28 44.16			
	16 57	22 20.8	73.7	.566	.658	.908	44.31	+ 0.011		
July 28	17 0	22 23.8	73.6	59.676 .662 .520 .656	68.536 .532 .520 .541	8.860 .870 .859 .885	44.07 44.12 44.06 44.19		2	III. A. $\tau = 8^h 39^m.$ $\Delta\delta = 44''.133$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.043$
	— 3 ^{m.3}			59.667 68.556 .549 .550 .551	68.528 59.657 .669 .671 .672	.861 .899 .880 .879 .879	44.07 44.26 44.17 44.16 44.16			
	17 23	22 46.8	72.8	.539	.670	.860	44.07	+ 0.011		
July 29	17 31	22 14.8	75.0	59.624 .671 .652 .642	68.576 .571 .578 .555	8.881 .900 .920 .913	44.52 44.27 44.40 44.33	+ 0.011	2	III. B. $\tau = 8^h 32^m.4$ $\Delta\delta = 44''.327$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.069$
	— 3 ^{m.3}			59.660 68.542 .539 .557 .546	68.581 59.622 .653 .639 .639	.921 .920 .880 .918 .917	44.37 44.36 44.20 44.36 44.30			
	17 25	22 48.8	73.3	.538	.659	.879	44.16	+ 0.011		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.		Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880.	h.	m.	h.	m.	°	r.	r.	r.	"	"		
July 30	16	53	22	16.7	74.5	68.520	59.676	8.844	43.99	+ 0.011	3	Ill. A.
						.533	.637	.896	44.25			
						.559	.681	.878	44.16			
						.542	.656	.886	44.20			
						68.548	59.676	.872	44.13			$\tau = 8^h 24^m.9$
	— 3 ^m .4					59.681	68.545	.864	44.00			$\Delta\delta = 44''.137$
						.678	.563	.885	44.19			$\Delta\rho = + 0''.011$
						.653	.514	.861	44.07			$r_1 = \pm 0''.055$
						.657	.547	.890	44.22			
	17	12	22	35.7	73.9	.674	.535	.861	44.07	+ 0.011		
July 31	17	17	22	40.6	78.3	59.640	68.546	8.906	44.30	+ 0.011	2	Ill. A.
						.682	.548	.866	44.10			
						.626	.520	.894	44.24			
						.669	.512	.843	43.98			
	— 3 ^m .5					59.658	68.548	.890	44.22			$\tau = 8^h 41^m.8$
						68.561	59.648	.913	44.33			$\Delta\delta = 44''.178$
						.550	.660	.890	44.22			$\Delta\rho = + 0''.011$
						.518	.675	.843	43.98			$r_1 = \pm 0''.084$
						.534	.659	.875	44.14			
	17	38	23	1.6	77.8	.551	.650	.901	44.27	+ 0.011		
Aug. 12	17	16	22	38.8	76.5	59.660	68.534	8.874	44.14	+ 0.011	2	Ill. A.
						.640	.551	.911	44.32			
						.644	.549	.905	44.29			
						.672	.514	.842	43.98			
	— 4 ^m .3					59.660	68.550	.890	44.22			$\tau = 7^h 56^m.3$
						68.522	59.661	.861	44.07			$\Delta\delta = 44''.107$
						.509	.662	.847	44.00			$\Delta\rho = + 0''.011$
						.539	.695	.844	43.99			$r_1 = \pm 0''.087$
						.521	.664	.857	44.05			
	17	40	23	2.8	75.6	.509	.660	.849	44.01	+ 0.011		
Aug. 12	19	26	0	48.8	72.5	68.556	59.661	8.895	44.24	+ 0.011	2	Ill. B.
						.554	.660	.894	44.24			
						.550	.625	.925	44.39			
						.560	.663	.897	44.25			
						68.566	59.642	.924	44.38			$\tau = 10^h 5^m.9$
	— 4 ^m .3					59.668	68.558	.890	44.22			$\Delta\delta = 44''.274$
						.658	.551	.891	44.23			$\Delta\rho = + 0''.011$
						.669	.560	.891	44.22			$r_1 = \pm 0''.043$
						.644	.552	.908	44.31			
	19	50	1	12.8	71.0	.646	.545	.871	44.26	+ 0.011		
Aug. 15	18	16	23	38.5	72.0	68.548	59.635	8.913	44.33	+ 0.011	2	Ill. A.
						.572	.650	.922	44.38			
						.565	.663	.902	44.28			
						.530	.674	.856	44.05			
	— 4 ^m .6					68.506	59.672	.834	43.94			$\tau = 8^h 47^m.5$
						59.656	68.539	.883	44.18			$\Delta\delta = 44''.184$
						.659	.552	.893	44.23			$\Delta\rho = + 0''.011$
						.629	.530	.901	44.27			$r_1 = \pm 0''.101$
						.654	.542	.888	44.21			
	18	47	0	9.5	70.5	.667	.507	.840	43.97	+ 0.011		
Aug. 16	16	58	22	20.5	73.5	59.640	68.544	8.904	44.29	+ 0.011	3	Ill. A.
						.679	.567	.888	44.21			Twilight.
						.644	.530	.886	44.20			
						.658	.546	.888	44.21			
						59.662	68.537	.875	44.24			$\tau = 7^h 19^m.3$
	— 4 ^m .6					68.532	59.646	.886	44.20			$\Delta\delta = 44''.199$
						.552	.669	.883	44.18			$\Delta\rho = + 0''.011$
						.569	.641	.928	44.40			$r_1 = \pm 0''.064$
						.539	.679	.860	44.07			
	17	16	22	38.5	73.0	.552	.688	.864	44.09	+ 0.011		

Observations of α Lyre and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\epsilon$	$\Delta\rho$	Wt.	Remarks.
1880. Aug. 16	h. m. 13 31	h. m. 22 31.1	72.7	r. 59.674 .671 .660 .668	r. 68.538 .539 .529 .546	r. 8.864 .868 .849 .878	44.09 44.11 44.01 44.16	+ 0.012	2	Ill. B. $\tau = 7^h. 46^m.9$ $\Delta\delta = 44''.158$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.076$
	14 56			59.642 68.562 .545 .569 .526	68.549 59.657 .643 .656 .663	.907 .905 .902 .913 .863	44.30 44.29 44.28 44.33 44.08			
	17 48	23 10.5	71.1	.552	.659	.893	44.23	+ 0.012		
Sept. 14	19 44	1 12.8	59.7	68.544 .514 .520 .552	59.641 .616 .641 .631	.898 .898 .879 .919	44.28 44.26 44.16 44.36	+ 0.012	2	Ill. A. Images very blazing. $\tau = 8^h. 25^m.6$ $\Delta\delta = 44''.246$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.059$
	+ 1 ^m .7			68.530 59.593 .601 .624 .615	59.631 68.496 .522 .489 .498	.899 .903 .921 .865 .883	44.26 44.28 44.37 44.09 44.18			
	20 19	1 47.8	58.8	.614	.504	.890	44.22	+ 0.012		
Sept. 15	19 42	1 10.9	62.0	59.630 .635 .640 .650	68.528 .531 .537 .520	.894 .896 .897 .870	44.26 44.25 44.25 44.12	+ 0.012	2	Ill. A. $\tau = 8^h. 17^m.3$ $\Delta\delta = 44''.233$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.072$
	+ 1 ^m .8			59.629 68.486 .542 .502 .520	68.549 59.631 .616 .626 .611	.920 .855 .926 .876 .901	44.36 44.04 44.40 44.15 44.27			
	20 12	1 40.9	60.5	.628	.504	.892	44.23	+ 0.012		
Sept. 15	20 11	1 43.0	60.5	59.644 .635 .638 .624	68.527 .548 .511 .498	8.883 .913 .873 .874	44.18 44.33 44.11 44.14	+ 0.012	2	Ill. B. $\tau = 8^h. 46^m.7$ $\Delta\delta = 44''.185$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.068$
	+ 1 ^m .8			59.640 68.515 .554 .516 .517	68.533 59.639 .659 .655 .651	.893 .876 .895 .861 .854	44.23 44.15 44.24 44.07 44.04			
	20 38	2 6.9	59.6	.530	.616	.914	44.34	+ 0.012		
Sept. 16	20 20	1 44.1	65.0	59.623 .653 .600 .665	68.485 .504 .521 .526	8.862 .851 .921 .861	44.08 44.02 44.37 44.07	+ 0.012	2	Ill. B. $\tau = 8^h. 49^m.0$ $\Delta\delta = 44''.165$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.097$
	+ 2 ^m .0			59.609 68.506 .540 .526 .503	68.538 59.658 .640 .638 .627	.929 .848 .900 .888 .876	44.41 44.01 44.27 44.21 44.15			
	20 45	2 14.1	64.5	.511	.653	.858	44.06	+ 0.012		
Sept. 17	20 6	1 33.1	74.6	59.610 .646 .641 .657	68.515 .506 .523 .522	8.905 .860 .882 .865	44.29 44.07 44.18 44.09	+ 0.011	2	Ill. A. $\tau = 8^h. 40^m.2$ $\Delta\delta = 44''.212$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.084$
	+ 2 ^m .2			59.644 68.520 .501 .490 .521	68.498 59.630 .590 .610 .592	.854 .890 .911 .880 .929	44.04 44.22 44.32 44.17 44.41			
	20 49	2 18.3	71.0	.543	.631	.912	44.33	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880, Sept. 17	h. m. 20 54	h. m. 2 23.3	$^{\circ}$ 73.0	r. 59.644 .603 .632 .613	r. 68.531 .548 .526 .545	r. 8.887 .945 .894 .932	δ 44.20 44.49 44.24 44.42	ρ + 0.012 "	2	III. B. Images very blazing and unsteady. $\tau = 6^h 25^m.1$ $\Delta\delta = 44''.136$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.152$
	+ 2 ^m .2			59.637 68.500 .493 .484 .515 .493	68.528 59.655 .637 .680 .646 .677	8.91 .845 .856 .804 .869 .816	44.22 43.99 44.05 43.79 44.11 43.85	+ 0.012		
Sept. 18	19 8	0 37.4	78.0	68.539 .526 .524 .559	59.598 .612 .628 .619	8.941 .914 .896 .940	44.47 44.34 44.25 44.46	+ 0.011	3	III. A. $\tau = 7^h 26^m.1$ $\Delta\delta = 44''.263$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.083$
	+ 2 ^m .3			68.542 59.632 .632 .655 .651 .629	59.657 68.515 .513 .522 .547 .519	.885 .883 .881 .867 .871 .890	44.19 44.18 44.17 44.10 44.25 44.22	+ 0.011		
Sept. 18	19 26	0 55.4	77.6					+ 0.011		
Sept. 18	19 29	0 58.4	77.6	68.528 .546 .555 .513	59.620 .616 .620 .634	8.908 .930 .935 .879	44.31 44.42 44.44 44.16	+ 0.011	3	III. B. $\tau = 7^h 30^m.5$ $\Delta\delta = 44''.342$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.060$
	+ 2 ^m .3			68.526 59.620 .631 .640 .641 .624	59.620 68.511 .539 .540 .561 .546	.906 .934 .908 .900 .925 .922	44.30 44.44 44.31 44.27 44.39 44.38	+ 0.011		
Sept. 22	19 25	0 54.5	66.5	59.628 .611 .626 .650	68.500 .506 .497 .540	8.872 .895 .871 .890	44.13 44.24 44.12 44.22	+ 0.012	3	III. A. $\tau = 7^h 30^m.4$ $\Delta\delta = 44''.249$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.068$
	+ 2 ^m .4			59.640 68.543 .521 .522 .531 .529	68.519 59.608 .612 .602 .614 .628	.879 .935 .909 .920 .895 .901	44.16 44.44 44.31 44.36 44.24 44.27	+ 0.012		
Sept. 22	19 49	1 18.5	65.8					+ 0.012		
Sept. 22	19 52	1 21.5	65.8	59.631 .647 .634 .678	68.519 .513 .537 .533	8.888 .866 .903 .855	44.21 44.10 44.28 44.04	+ 0.012	3	III. B. $\tau = 7^h 37^m.8$ $\Delta\delta = 44''.217$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.075$
	+ 2 ^m .4			59.641 68.533 .516 .519 .537 .520	68.536 59.634 .610 .658 .628 .600	.895 .899 .906 .861 .909 .920	44.24 44.26 44.30 44.07 44.31 44.36	+ 0.012		
Oct. 20	20 17	1 46.5	64.9					+ 0.012		
Oct. 20	19 39	1 9.3	56.5	59.629 .622 .630 .618	68.520 68.524 .529 .513	8.891 .906 .899 .895	44.22 44.30 44.26 44.24	+ 0.012	3	III. A. $\tau = 5^h 53^m.1$ $\Delta\delta = 44''.137$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.091$
	+ 3 ^m .2			59.657 68.488 .518 .499 .480 .510	68.538 59.660 .644 .655 .640 .629	.881 .828 .874 .844 .840 .881	44.17 43.91 44.14 43.99 43.97 44.17	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880. Oct. 20	h. m. 20 4	h. m. 1 34.3	55.8	r. 59.640 .625 .662 .624	r. 68.526 .526 .537 .540	r. 8.886 .901 .875 .916	" 44.20 44.27 44.14 44.35	" + 0.012	3	Ill. B. $r = 6^h 19^m.0$ $\Delta\delta = 44''.230$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.064$
	+ 3 ^{m.2}			59.632 68.539 .514 .547 .524	68.555 59.640 .644 .640 .648	.923 .899 .870 .907 .876	44.38 44.26 44.12 44.30 44.15			
	20 26	1 56.3	54.0	.515	.642	.873	44.13	+ 0.012		
Oct. 24	19 43	1 13.4	46.8	68.509 .518 .521 .520	59.629 .653 .631 .628	8.880 .865 .890 .892	44.17 44.09 44.22 44.23	+ 0.012	3	Ill. A. Windy. $r = 5^h 41^m.5$ $\Delta\delta = 44''.201$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.036$
	+ 3 ^{m.3}			68.520 59.639 .630 .638 .625	59.620 68.535 .520 .524 .516	.900 .896 .890 .886 .891	44.27 44.25 44.22 44.20 44.22			
	20 3	1 33.4	45.5	.613	.488	.875	44.14	+ 0.012		
Oct. 24	20 8	1 38.4	45.5	68.502 .539 .530 .528	59.656 .613 .630 .624	8.846 .926 .900 .904	44.00 44.40 44.27 44.29	+ 0.013	3	Ill. B. $r = 6^h 8^m.9$ $\Delta\delta = 44''.183$ $\Delta\rho = + 0''.013$ $r_1 = \pm 0''.079$
	+ 3 ^{m.3}			68.508 59.658 .646 .630 .620	59.620 68.539 .519 .493 .504	.888 .881 .873 .863 .884	44.21 44.17 44.13 44.08 44.19			
	20 33	2 3.4	45.2	.656	.521	.865	44.09	+ 0.013		
Oct. 25	19 50	1 20.4	49.5	68.511 .541 .503 .527	59.641 .646 .633 .634	8.870 .895 .870 .893	44.12 44.24 44.12 44.23	+ 0.012	3	Ill. A. $r = 5^h 43^m.5$ $\Delta\delta = 44''.162$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.061$
	+ 3 ^{m.3}			68.540 59.632 .646 .656 .630	59.642 68.509 .492 .512 .529	.898 .877 .846 .856 .899	44.26 44.15 44.00 44.05 44.26			
	20 8	1 38.4	49.0	.655	.539	.884	44.19	+ 0.012		
Oct. 25	20 10	1 40.4	49.0	68.515 .504 .525 .532	59.651 .650 .621 .640	8.864 .854 .904 .892	44.09 44.04 44.29 44.23	+ 0.012	3	Ill. B. $r = 6^h 6^m.5$ $\Delta\delta = 44''.217$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.071$
	+ 3 ^{m.3}			68.516 59.639 .646 .628 .640	59.640 68.515 .542 .550 .544	.876 .876 .896 .922 .904	44.15 44.15 44.25 44.37 44.29			
	20 34	2 4.4	48.5	.631	.539	.908	44.31	+ 0.012		
Oct. 31	20 4	1 31.8	52.0	59.634 .633 .655 .633	68.529 .531 .522 .547	8.895 .898 .867 .914	44.24 44.26 44.10 44.34	+ 0.012	3	Ill. A. $r = 5^h 32^m.8$ $\Delta\delta = 44''.214$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.061$
	+ 0 ^{m.7}			59.638 68.511 .511 .542 .519	68.528 59.639 .644 .626 .639	.890 .872 .867 .916 .880	44.22 44.13 44.10 44.35 44.17			
	20 25	1 52.8	51.5	.538	.646	.892	44.23	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880. Oct. 31	h. m. 20 30	h. m. 1 57.8	° 51.5	r. 59.639	r. 68.534	r. 8.895	" 44.24	" + 0.012	3	Ill. B.
				.630	.538	.908	44.31			
				.643	.507	.864	44.09			
				.629	.512	.883	44.18			
				59.660	68.542	.882	44.18			$\tau = 6^h 0^m.2$
	+ 0 ^m .7			68.530	59.641	.889	44.21			$\Delta\delta = 44''.167$
				.516	.639	.877	44.15			$\Delta\rho = + 0''.012$
				.500	.644	.856	44.05			$r_1 = \pm 0''.052$
				.524	.657	.867	44.10			
	20 54	2 21.8	51.0	.527	.649	.878	44.16	+ 0.012		
Nov. 1	20 16	1 43.8	51.5	59.641	68.522	8.881	44.17	+ 0.012	3	Ill. A.
				.632	.532	.900	44.27			
				.640	.501	.867	44.07			
				.636	.524	.888	44.21			
	+ 0 ^m .7			59.615	68.524	.909	44.31			$\tau = 5^h 36^m.8$
				68.529	59.655	.874	44.14			$\Delta\delta = 44''.127$
				.511	.664	.847	44.00			$\Delta\rho = + 0''.012$
				.518	.677	.841	43.97			$r_1 = \pm 0''.076$
				.527	.669	.858	44.06			
	20 29	1 56.8	51.0	.525	.665	.860	44.07	+ 0.012		
Nov. 1	20 32	1 59.8	51.0	59.662	68.530	8.868	44.11	+ 0.012	3	Ill. B.
				.670	.530	.860	44.07			
				.672	.520	.848	44.01			
				.664	.517	.853	44.03			
	+ 0 ^m .7			59.653	68.511	.858	44.06			$\tau = 5^h 55^m.8$
				68.514	59.643	.871	44.12			$\Delta\delta = 44''.122$
				.546	.656	.890	44.22			$\Delta\rho = + 0''.012$
				.511	.634	.877	44.15			$r_1 = \pm 0''.057$
				.530	.648	.882	44.18			
	20 51	1 18.8	50.0	.551	.650	.901	44.27	+ 0.012		
Nov. 2	20 24	1 51.9	55.5	59.640	68.498	8.858	44.06	+ 0.012	2	Ill. A.
				.668	.521	.853	44.03			
				.648	.483	.835	43.94			
				.647	.529	.882	44.18			
	+ 0 ^m .8			59.631	68.531	.900	44.27			$\tau = 5^h 43^m.5$
				68.511	59.624	.887	44.20			$\Delta\delta = 44''.148$
				.516	.608	.908	44.31			$\Delta\rho = + 0''.012$
				.544	.640	.904	44.29			$r_1 = \pm 0''.083$
				.493	.632	.861	44.07			
	20 42	2 9.9	54.0	.511	.639	.872	44.13	+ 0.012		
Dec. 3	21 43	3 12.4	38.0	59.611	68.500	8.889	44.21	+ 0.014	3	Ill. A. Twilight.
				.633	.515	.882	44.18			
				.616	.505	.889	44.21			
				.637	.490	.853	44.03			
				59.640	68.516	.876	44.15			$\tau = 5^h 0^m.4$
	+ 2 ^m .3			68.526	59.643	.883	44.18			$\Delta\delta = 44''.103$
				.484	.648	.836	43.95			$\Delta\rho = + 0''.014$
				.489	.640	.849	44.01			$r_1 = \pm 0''.070$
				.490	.651	.839	43.96			
	21 58	3 27.4	37.6	.530	.654	.876	44.15	+ 0.014		
Dec. 3	22 0	3 29.4	37.6	59.632	68.520	8.888	44.21	+ 0.014	3	Ill. B.
				.621	.511	.890	44.22			
				.636	.505	.869	44.11			
				.634	.505	.871	44.12			
				59.644	68.491	.847	44.00			$\tau = 5^h 20^m.8$
	+ 2 ^m .3			68.493	59.623	.870	44.12			$\Delta\delta = 44''.114$
				.510	.625	.885	44.19			$\Delta\rho = + 0''.015$
				.477	.641	.836	43.95			$r_1 = \pm 0''.058$
				.502	.630	.872	44.13			
	22 22	3 51.4	36.7	.505	.641	.864	44.09	+ 0.015		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1906	h. m.	h. m.		r.	r.	r.	"	"		
Dec. 7	21 36	3 27.3	23.0	68.519	59.667	8.852	44.03	± 0.014	2	Ill. A. Twilight.
				.542	.640	.869	44.31			
				.536	.636	.860	44.17			
				.532	.632	.860	44.17			
	$\pm 2^m.7$			68.547	59.656	8.852	44.23			$\tau = 5^h 1^m.5$
				59.657	68.521	.863	44.08			$\Delta\delta = 44''.133$
				.646	.536	.850	43.92			$\Delta\rho = 0''.015$
				.642	.537	.855	44.19			$r_1 = \pm 0''.073$
				.652	.524	.872	44.13			
	22 16	3 45.8	22.5	64.3	.509	.866	44.10	± 0.015		
Dec. 9	22 9	3 39.0	24.0	59.627	68.493	8.865	44.09	± 0.014	2	Ill. A
				.601	.509	.868	44.31			
				.620	.437	.856	43.95			
				.624	.425	.871	44.12			
	$\pm 2^m.9$			59.621	68.503	8.862	44.16			$\tau = 5^h 5^m.3$
				68.510	59.621	.860	44.21			$\Delta\delta = 44''.125$
				.592	.532	.870	44.12			$\Delta\rho = 0''.015$
				.508	.640	.868	44.11			$r_1 = \pm 0''.080$
				.472	.640	.852	43.93			
	22 28	3 58.0	23.5	520	.628	.892	44.23	± 0.015		
Dec. 9	22 30	4 0.0	23.5	59.650	68.500	8.850	44.02	± 0.015	2	Ill. B.
				.634	.489	.855	44.03			
				.628	.503	.875	44.14			
				.630	.511	.881	44.17			
	$\pm 2^m.9$			59.627	68.507	.880	44.17			$\tau = 5^h 28^m.7$
				68.491	59.639	.852	44.03			$\Delta\delta = 44''.049$
				.508	.680	.828	43.91			$\Delta\rho = 0''.016$
				.501	.664	.837	43.95			$r_1 = \pm 0''.059$
				.490	.640	.850	44.02			
	22 54	4 24.0	22.8	.511	.657	.854	44.04	± 0.016		
Dec. 11	22 15	3 45.1	29.4	68.502	59.618	8.884	44.19	± 0.014	1	Ill. A.
				.513	.620	.893	44.23			
				.513	.647	.866	44.10			
				.501	.622	.879	44.16			
	$\pm 2^m.0$			68.515	59.612	.903	44.28			$\tau = 5^h 0^m.5$
				59.600	68.481	.821	43.87			$\Delta\delta = 44''.147$
				.630	.490	.860	44.07			$\Delta\rho = 0''.015$
				.618	.505	.887	44.20			$r_1 = \pm 0''.078$
				.638	.501	.863	44.08			
	22 28	3 58.1	28.6	.622	.507	.885	44.19	± 0.015		
Dec. 11	22 30	4 0.1	28.6	68.493	59.666	8.827	43.90	± 0.015	2	Ill. B.
				.510	.647	.863	44.08			
				.496	.665	.831	43.92			
				.494	.650	.844	43.99			
				68.483	59.666	.817	43.85			$\tau = 5^h 17^m.0$
	$\pm 2^m.0$			59.670	68.513	.843	43.98			$\Delta\delta = 44''.047$
				.616	.500	.884	44.19			$\Delta\rho = 0''.016$
				.642	.508	.866	44.10			$r_1 = \pm 0''.088$
				.631	.520	.898	44.26			
	22 46	4 16.1	28.2	.620	.486	.866	44.10	± 0.016		
Dec. 13	22 27	3 57.3	41.5	59.622	68.486	8.864	44.09	± 0.015	2	Ill. A.
				.640	.499	.850	44.02			
				.636	.469	.833	43.93			
				.630	.437	.867	44.10			
	$\pm 2^m.2$			52.647	68.480	.833	43.93			$\tau = 5^h 8^m.3$
				68.469	59.632	.867	44.10			$\Delta\delta = 44''.005$
				.448	.613	.835	43.94			$\Delta\rho = 0''.016$
				.463	.641	.822	43.88			$r_1 = \pm 0''.056$
				.473	.610	.863	44.08			
	22 47	4 17.3	40.0	.490	.647	.843	43.98	± 0.016		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880. Dec. 13	h. m. 22 49	h. m. 4 19.3	° 40.0	r. 59.617	r. 68.499	r. 8.882	" 44.18	" + 0.016	■	Ill. B.
				.584	.483	.899	44.26			
				.669	.518	.849	44.01			
				.632	.494	.862	44.08			
				59.610	68.469	.859	44.06			$\tau = 5^h 31^m.3$
	+ 3 ^m .2			68.500	59.604	.896	44.25			$\Delta\delta = 44''.120$
				.483	.643	.840	43.97			$\Delta\rho = + 0''.017$
				.509	.621	.888	44.21			$r_1 = + 0''.069$
				.511	.636	.875	44.14			
	23 11	4 41.3	39.5	.486	.632	.854	44.04	+ 0.017		
Dec. 15	22 40	4 10.4	41.5	59.628	68.459	8.831	43.92	+ 0.015	2	Ill. A.
				.658	.482	.824	43.89			
				.646	.488	.842	43.98			
				.632	.470	.838	43.96			
	+ 3 ^m .3			59.617	68.474	.857	44.05			$\tau = 5^h 12^m.0$
				68.478	59.624	.854	44.04			$\Delta\delta = 44''.022$
				.444	.644	.800	43.77			$\Delta\rho = + 0''.016$
				.482	.582	.900	44.27			$r_1 = \pm 0''.102$
				.482	.597	.885	44.19			
	22 57	4 27.4	41.0	.498	.622	.876	44.15	+ 0.016		
Dec. 16	22 40	4 10.5	40.0	68.508	59.654	8.854	44.04	+ 0.015	3	Ill. A.
				.516	.622	.894	44.24			
				.494	.620	.874	44.14			
				.478	.639	.839	43.96			
				68.482	59.601	.881	44.17			$\tau = 5^h 6^m.7$
	+ 3 ^m .4			59.647	68.480	.833	43.93			$\Delta\delta = 44''.040$
				.618	.482	.864	44.09			$\Delta\rho = + 0''.016$
				.620	.458	.838	43.96			$r_1 = \pm 0''.077$
				.628	.452	.824	43.89			
	22 54	4 24.5	39.0	.611	.454	.843	43.98	+ 0.016		
Dec. 16	22 57	4 27.5	39.0	68.495	59.597	8.898	44.26	+ 0.016	3	Ill. B.
				.501	.624	.877	44.15			
				.493	.616	.877	44.15			
				.504	.623	.881	44.17			
				68.480	59.644	.836	43.95			$\tau = 5^h 25^m.2$
	+ 3 ^m .4			59.641	68.500	.859	44.06			$\Delta\delta = 44''.137$
				.630	.502	.872	44.13			$\Delta\rho = + 0''.017$
				.618	.503	.885	44.19			$r_1 = \pm 0''.056$
				.638	.516	.878	44.16			
	23 14	4 44.5	38.5	.620	.496	.876	44.15	+ 0.017		
Dec. 18	22 53	4 19.9	35.5	59.634	68.496	8.862	44.08	+ 0.016	■	Ill. A.
				.620	.495	.875	44.14			
				.623	.503	.880	44.17			
				.612	.477	.865	44.09			
	- 0 ^m .2			59.654	68.497	.843	43.98			$\tau = 5^h 9^m.7$
				68.480	59.638	.842	43.98			$\Delta\delta = 44''.052$
				.500	.669	.831	43.92			$\Delta\rho = + 0''.016$
				.451	.582	.869	44.11			$r_1 = \pm 0''.069$
				.520	.641	.879	44.16			
	23 10	4 36.9	35.0	.448	.623	.825	43.89	+ 0.017		
Dec. 18	23 12	4 38.9	35.0	59.603	68.489	8.886	44.20	+ 0.017	2	Ill. B.
				.631	.458	.827	43.90			
				.611	.470	.859	44.06			
				.601	.507	.906	44.30			
	- 0 ^m .2			59.629	68.482	.853	44.03			$\tau = 5^h 29^m.7$
				68.444	59.656	.788	43.71			$\Delta\delta = 44''.016$
				.480	.633	.847	44.00			$\Delta\rho = + 0''.018$
				.461	.621	.840	43.97			$r_1 = \pm 0''.107$
				.516	.666	.850	44.02			
	23 31	4 57.9	34.0	.503	.663	.840	43.97	+ 0.019		

Observations of α Lyræ and Companion—Continued.

Date	Clock Time and Corr.	Hour Angle	Temp.	Micr.	Micr.	$\pm\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
<i>1st run</i> Dec. 2	<i>h. m.</i> 13 11	<i>h. m.</i> 4 38.0	<i>s.</i> 32.7	<i>r.</i> 68.329	<i>r.</i> 59.671	<i>r.</i> 8.855	44.06	-0.017	2	Ill. B.
				.530	.684	.596	44.25			
				.500	.684	.576	43.95			
				.511	.683	.575	44.10			$\tau = 5^h 13^m 0$
				68.479	59.627	.845	43.99			$\Delta\delta = 44'' .003$
				59.391	68.484	.893	44.23			$\Delta\rho = 8 \text{ } 0'' .018$
				.630	.477	.842	43.95			$r_1 = 3 \text{ } 0'' .081$
				.614	.440	.826	43.99			
				.599	.449	.850	44.02			
				.618	.462	.844	43.99	+0.019		
<i>2nd run</i> Feb. 5	13 22	20 50.3	8.7	59.611	68.344	8.933	44.43	+0.013	1	Ill. B.
				.614	.536	.922	44.38			Images very blazing
				.612	.505	8.893	44.23			and unsteady.
				.593	.535	9.032	44.92			
	<i>3rd run</i>			59.604	68.397	8.993	44.35			$\tau = 18^h 23^m .8$
				68.520	59.633	.887	44.20			$\Delta\delta = 44'' .042$
				.470	.568	.902	44.28			$\Delta\rho = 8 \text{ } 0'' .015$
				.539	.618	.921	44.37			$r_1 = 3 \text{ } 0'' .160$
				.472	.623	.849	44.61			
	15 45	21 13.3	8.6	.493	.603	.890	44.22	+0.015		
Feb. 10	13 23	20 51.2	34.0	59.630	68.534	8.904	44.29	+0.014	3	Ill. A.
				.600	.529	.929	44.41			
				.611	.520	.909	44.31			
				.589	.519	.921	44.37			$\tau = 18^h 12^m .0$
				59.632	68.564	.932	44.42			$\Delta\delta = 44'' .307$
	<i>4th run</i>			68.511	59.594	.917	44.35			$\Delta\rho = 8 \text{ } 0'' .014$
				.480	.580	.900	44.27			$r_1 = 3 \text{ } 0'' .009$
				.511	.604	.907	44.39			
				.459	.584	.875	44.14			
	15 52	21 20.2	33.6	.484	.595	.880	44.21	+0.014		
Feb. 12	13 22	20 50.1	31.0	59.611	68.521	8.910	44.32	+0.014	2	Ill. B.
				.582	.539	.957	44.55			
				.620	.527	.907	44.39			
				.564	.558	.994	44.73			$\tau = 18^h 5^m .0$
	<i>5th run</i>			59.612	68.541	.929	44.41			$\Delta\delta = 44'' .084$
				68.476	59.586	.860	44.28			$\Delta\rho = 8 \text{ } 0'' .014$
				.533	.600	.933	44.43			$r_1 = 3 \text{ } 0'' .105$
				.518	.621	.897	44.25			
				.536	.619	.917	44.35			
	13 35	21 23.1	30.6	.510	.608	.902	44.28	+0.014		
Feb. 13	13 35	21 3.0	26.8	59.622	68.482	8.860	44.07	+0.014	2	Ill. A.
				.586	.521	.935	44.44			
				.627	.530	.903	44.28			
				.634	.574	.920	44.36			
				59.621	68.597	.886	44.20			$\tau = 18^h 9^m .0$
	<i>6th run</i>			68.506	59.394	.912	44.33			$\Delta\delta = 44'' .009$
				.494	.612	.882	44.18			$\Delta\rho = 8 \text{ } 0'' .014$
				.536	.637	.869	44.26			$r_1 = 3 \text{ } 0'' .073$
				.548	.640	.908	44.31			
	15 58	21 26.0	29.4	.490	.612	.878	44.16	+0.014		
Feb. 14	13 17	20 43.0	22.8	68.511	59.633	8.878	44.10	+0.014	3	Ill. B.
				.518	.632	.886	44.20			
				.530	.611	.919	44.36			
				.536	.614	.925	44.38			$\tau = 17^h 46^m .1$
	<i>7th run</i>			68.524	59.607	.917	44.35			$\Delta\delta = 44'' .030$
				59.642	68.506	.864	44.09			$\Delta\rho = 8 \text{ } 0'' .014$
				.625	.520	.904	44.29			$r_1 = 3 \text{ } 0'' .075$
				.632	.506	.874	44.14			
				.640	.518	.878	44.16			
	15 38	21 6.0	22.5	.611	.533	.922	44.37	+0.014		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.		Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. Feb. 14	h. m.		h. m.		°	r.	r.	r.	"	"		
	15 40		21 8.0		22.5	68.507	59.631	8.876	44.15	0.014	3	Ill. A.
						.498	.619	.879	44.16			
						.498	.623	.875	44.14			
						.497	.636	.841	43.97			
						68.502	59.600	.902	44.28			$\tau = 18^h 8^m.0$
	+ 0 ^m .9					59.649	68.532	.883	44.18			$\Delta\delta = 44''.168$
						.653	.530	.877	44.15			$\Delta\rho = + 0''.014$
						.621	.526	.905	43.29			$r_1 = 0''.059$
						.640	.522	.882	44.18			
	15 50		21 27.0		22.0	.642	.524	.882	44.18	0.014		
Feb. 16	15 13		20 40.9		25.9	68.557	59.617	8.940	44.46	+ 0.014	3	Ill. B.
						.477	.613	.864	44.09			
						.546	.624	.922	44.38			
						.525	.620	.905	44.29			
						.499	.610	.889	44.21			$\tau = 17^h 36^m.1$
	+ 0 ^m .8					59.600	68.522	.922	44.37			$\Delta\delta = 44''.386$
						.622	.524	.902	44.28			$\Delta\rho = + 0''.014$
						.604	.490	.886	44.20			$r_1 = 0''.072$
						.622	.518	.896	44.25			
	15 38		21 5.9		24.6	.622	.516	.914	44.33	+ 0.014		
Feb. 16	15 40		21 7.9		24.6	68.484	59.614	8.870	44.12	0.014	3	Ill. A.
						.530	.619	.911	44.32			
						.512	.621	.891	44.22			
						.507	.620	.887	44.20			
						68.507	59.614	.893	44.23			$\tau = 18^h 3^m.0$
	+ 0 ^m .8					59.628	68.514	.886	44.20			$\Delta\delta = 44''.240$
						.623	.520	.897	44.25			$\Delta\rho = + 0''.014$
						.629	.517	.888	44.21			$r_1 = 0''.045$
						.624	.535	.911	44.32			
	16 5		21 32.9		24.3	.624	.537	.913	44.33	0.014		
Feb. 19	15 7		20 34.6		28.0	59.632	68.528	8.896	44.25	+ 0.014	3	Ill. B.
						.598	.515	.917	44.35			
						.607	.534	.927	44.40			
						.593	.536	.943	44.48			
						59.611	68.518	.907	44.30			$\tau = 17^h 26^m.5$
	+ 0 ^m .5					68.505	59.622	.883	44.18			$\Delta\delta = 44''.205$
						.508	.611	.897	44.25			$\Delta\rho = + 0''.014$
						.510	.621	.889	44.21			$r_1 = 0''.662$
						.528	.630	.898	44.26			
	15 37		21 4.6		27.8	.518	.618	.900	44.27	+ 0.014		
Feb. 19	15 39		21 6.6		27.8	59.607	68.510	8.903	44.28	+ 0.014	3	Ill. A.
						.621	.526	.905	44.29			
						.607	.519	.912	44.33			
						.598	.515	.917	44.35			
						59.618	68.529	.911	44.32			$\tau = 17^h 50^m.4$
	+ 0 ^m .5					68.530	59.632	.898	44.26			$\Delta\delta = 44''.297$
						.531	.506	.935	44.44			$\Delta\rho = + 0''.014$
						.518	.636	.882	44.18			$r_1 = \pm 0''.047$
						.521	.520	.901	44.27			
	16 5		21 32.6		27.2	.528	.632	.896	44.25	0.014		
Feb. 21	15 12		20 39.4		29.0	59.613	68.549	8.936	44.44	0.014	3	Ill. B.
						.615	.551	.936	44.45			
						.614	.519	.905	44.29			
						.602	.535	.933	44.43			
						59.617	68.540	.923	44.38			$\tau = 17^h 15^m.0$
	+ 0 ^m .3					68.511	59.624	.867	44.20			$\Delta\delta = 44''.289$
						.508	.617	.891	44.22			$\Delta\rho = + 0''.014$
						.526	.646	.880	44.17			$r_1 = \pm 0''.685$
						.492	.624	.868	44.11			
	15 37		21 4.4		28.8	.507	.620	.887	44.20	+ 0.014		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. Feb. 11	h. m. 1 1	h. m. 21 7.4	28.8	r. 59.599 .610 .607 .611	r. 68.518 .522 .507 .515	r. 8.919 .912 .900 .904	δ 44.36 44.33 44.27 44.29	δ + 0.014	3	Ill. A.
	+ 0 ^m .3			59.598 68.501 .522 .530 .530	68.510 59.632 .607 .621 .614	.912 .869 .915 .909 .916	44.32 44.11 44.34 44.31 44.35			$\tau = 17^h 40^m.9$ $\Delta\delta = 44''.290$ $\Delta\rho = + 0''.014$ $r_1 = \pm 0''.051$
	16 1	21 28.4	28.5	.501	.610	.891	44.22	+ 0.014		
Mar. 14	1 1	20 57.0	33.8	59.616 .578 .621 .580 59.609	68.526 .526 .514 .534 68.528	8.910 .948 .913 .954 .919	44.32 44.50 44.33 44.54 44.36	+ 0.014	3	Ill. B.
	1 ^m .1			68.518 .524 .518 .529	59.632 .579 .600 .628	.886 .945 .918 .901	44.20 44.49 44.36 44.27			$\tau = 16^h 11^m.4$ $\Delta\delta = 44''.387$ $\Delta\rho = + 0''.014$ $r_1 = \pm 0''.677$
	15 59	21 25.0	33.5	.519	.571	.948	44.50	+ 0.014		
Mar. 14	16 2	21 28.0	33.5	59.609 .639 .609 .634	68.498 .526 .538 493	8.889 .859 .929 .859	44.21 44.06 44.41 44.06	+ 0.014	2	Ill. A.
	1 ^m .1			59.598 68.534 .518 .527 .500	68.505 59.611 .646 .637 .644	.907 .923 .872 .890 .856	44.30 44.38 44.13 44.22 44.05			$\tau = 16^h 40^m.9$ $\Delta\delta = 44''.193$ $\Delta\rho = + 0''.014$ $r_1 = \pm 0''.090$
	16 27	21 53.0	33.0	.594	.635	.869	44.11	+ 0.014		
Mar. 15	1 26	20 51.9	38.8	59.618 .597 .650 .590	68.536 .538 .558 .520	8.918 .941 .908 .930	44.36 44.47 44.31 44.41	+ 0.014	3	Ill. B.
	1 ^m .2			59.599 68.530 .525 .523 .514	68.524 59.590 .614 .613 .610	.925 .940 .911 .910 .904	44.39 44.46 44.32 44.32 44.29			$\tau = 16^h 0^m.4$ $\Delta\delta = 44''.360$ $\Delta\rho = + 0''.014$ $r_1 = \pm 0''.047$
	15 50	21 15.9	38.5	.580	.619	.901	44.27	+ 0.014		
Mar. 15	1 36	1 17.9	38.5	59.608 .613 .609 .628	68.512 .508 .518 .520	8.889 .897 .909 .892	44.21 44.25 44.31 44.23	+ 0.014	2	Ill. A. Images blurred.
	1 ^m .2			59.611 68.548 .513 .532 .550	68.527 59.575 .637 .618 .622	.916 .973 .876 .914 .928	44.35 44.63 44.15 44.34 44.40			$\tau = 16^h 25^m.9$ $\Delta\delta = 44''.324$ $\Delta\rho = + 0''.014$ $r_1 = \pm 0''.090$
	16 13	21 40.9	38.5	.528	.607	.921	44.37	+ 0.014		
Mar. 21	15 31	20 56.4	34.0	68.535 .536 .490 .569	59.592 .582 .578 .581	8.943 .954 .912 .988	44.48 44.54 44.33 44.70	+ 0.014	2	Ill. B.
	1 ^m .7			68.548 59.599 .591 .600 .606	59.612 68.517 .521 .512 .522	.936 .913 .930 .912 .916	44.44 44.36 44.41 44.33 44.35			$\tau = 15^h 42^m.8$ $\Delta\delta = 44''.442$ $\Delta\rho = + 0''.014$ $r_1 = \pm 0''.078$
	16 51	21 23.4	34.0	.602	.546	.944	44.48	+ 0.014		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.		Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. Mar. 21	h.	m.	h.	m.	°	r.	r.	r.	"	"		
	16	2	21	27.4	34.0	68.537	59.612	8.925	44.39	+ 0.014	2	Ill. A.
						.514	.582	.932	44.42			
						.560	.610	.950	44.51			
						.512	.629	.883	44.18			$\tau = 16^h 12^m.2$
						68.482	59.607	.875	44.14			$\Delta\delta = 44''.335$
	— 1 ^m .7					59.620	68.530	.910	44.32			$\Delta\rho = + 0''.014$
						.629	.530	.901	44.27			$r_1 = 1. 0''.076$
						.603	.520	.917	44.35			
						.610	.540	.930	44.42			
	16 26		21	51.4	34.3	.610	.527	.917	44.35	+ 0.014		
Mar. 23	16	7	21	32.3	33.5	68.521	59.623	8.898	44.26	+ 0.014	2	Ill. B.
						.571	.608	.963	44.58			
						.528	.638	.890	44.22			
						.536	.615	.921	44.37			$\tau = 16^h 7^m.3$
	— 1 ^m .8					68.530	59.619	.911	44.32			$\Delta\delta = 44''.341$
						59.589	68.523	.934	44.44			$\Delta\rho = + 0''.014$
						.592	.530	.938	44.46			$r_1 = \pm 0''.089$
						.616	.502	.886	44.20			
						.630	.511	.881	44.17			
	16 27		21	52.3	33.0	.605	.531	.926	44.39	+ 0.013		
Mar. 23	16	30	21	55.3	33.0	68.497	59.634	8.863	44.08	+ 0.013	2	Ill. A.
						.538	.623	.915	44.34			
						.513	.615	.898	44.26			
						.503	.627	.876	44.15			$\tau = 16^h 28^m.7$
						68.528	59.628	.900	44.27			$\Delta\delta = 44''.300$
	— 1 ^m .8					59.612	68.525	.913	44.33			$\Delta\rho = + 0''.013$
						.607	.553	.946	44.49			$r_1 = \pm 0''.079$
						.600	.520	.920	44.36			
						.600	.514	.914	44.34			
	16 47		22	12.3	32.7	.607	.531	.924	44.38	+ 0.013		
Mar. 26	16	10	21	35.1	31.8	59.599	68.530	8.931	44.42	+ 0.014	2	Ill. B.
						.574	.548	.974	44.63			
						.597	.527	.930	44.42			
						.599	.566	.967	44.60			$\tau = 16^h 0^m.8$
	— 2 ^m .0					59.600	68.547	.947	44.50			$\Delta\delta = 44''.462$
						68.538	59.621	.917	44.35			$\Delta\rho = + 0''.014$
						.549	.600	.949	44.51			$r_1 = \pm 0''.073$
						.552	.603	.949	44.51			
						.539	.614	.925	44.39			
	16 35		22	0.1	31.5	.530	.626	.904	44.29	+ 0.014		
Mar. 26	16	38	22	3.1	31.5	59.614	68.500	8.886	44.20	+ 0.013	2	Ill. A.
						.614	.532	.918	44.36			
						.600	.523	.923	44.38			
						.614	.519	.905	44.29			$\tau = 16^h 27^m.7$
						59.603	68.518	.915	44.34			$\Delta\delta = 44''.327$
	— 2 ^m .0					68.511	59.610	.901	44.27			$\Delta\rho = + 0''.013$
						.536	.613	.923	44.38			$r_1 = 1. 0''.053$
						.531	.587	.944	44.48			
						.524	.620	.904	44.29			
	17 1		22	26.1	31.0	.520	.617	.903	44.28	+ 0.013		
Mar. 27	16	10	21	35.0	33.0	68.536	59.610	8.926	44.40	+ 0.014	3	Ill. B.
						.533	.600	.933	44.43			
						.544	.614	.930	44.42			
						.546	.601	.945	44.49			$\tau = 15^h 57^m.2$
	— 2 ^m .1					68.512	59.596	.916	44.35			$\Delta\delta = 44''.385$
						59.599	68.498	.899	44.26			$\Delta\rho = + 0''.014$
						.632	.523	.891	44.22			$r_1 = + 0''.062$
						.603	.532	.929	44.41			
						.600	.520	.920	44.36			
	16 36		22	1.0	32.7	.590	.539	.949	44.51	+ 0.013		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.		Temp.	Mier.	Mier.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
	h.	m.	h.	m.		r.	r.	r.		"		
Mar. 27	16	38	22	3.0	32.7	68.550	59.579	8.971	44.62	+ 0.013	3	Ill. A.
						.500	.588	.912	44.33			
						.531	.594	.937	44.45			
						.530	.584	.946	44.50			
						68.510	59.590	.920	44.36			
						59.623	68.544	.921	44.37			$\tau = 15^h 2^m 8^s$
						.590	.546	.956	44.54			$\Delta\delta = 44''.414$
						.631	.528	.897	44.25			$\Delta\rho = + 0''.013$
						.618	.516	.898	44.26			$r_1 = \pm 0''.082$
	17	1	22	26.0	32.7	.599	.539	.940	44.46	+ 0.013		
Apr. 27	17	39	23	5.7	56.0	68.564	59.583	8.981	44.67	+ 0.012	3	Ill. B.
						.560	.614	.946	44.69			
						.570	.598	.972	44.62			
						68.592	59.621	.971	44.62			$\tau = 15^h 28^m.8$
						59.577	68.514	.937	44.45			$\Delta\delta = 44''.498$
						.587	.525	.938	44.46			$\Delta\rho = + 0''.012$
						.637	.520	.883	44.18			$r_1 = \pm 0''.118$
						.586	.545	.959	44.56			
	18	11	23	37.7	55.8	.620	.513	.894	44.23	+ 0.012		
Apr. 27	18	15	23	41.7	55.8	68.529	59.601	8.928	44.40	+ 0.012	2	Ill. A.
						.528	.604	.924	44.38			
						.535	.621	.914	44.34			
						.512	.623	.889	44.21			
						68.510	59.602	.908	44.31			$\tau = 15^h 1^m.2$
						59.620	68.520	.900	44.27			$\Delta\delta = 44''.314$
						.600	.482	.882	44.18			$\Delta\rho = + 0''.012$
						.602	.530	.928	44.40			$r_1 = \pm 0''.051$
						.604	.520	.916	44.35			
	18	40	23	6.7	55.5	.618	.524	.906	44.30	+ 0.012		
Apr. 29	16	49	22	13.6	52.7	59.610	68.560	8.950	44.52	+ 0.012	2	Ill. B.
						.608	.550	.942	44.47			
						.577	.543	.966	44.59			
						.608	.560	.952	44.52			
						59.620	68.550	.930	44.42			$\tau = 14^h 30^m.0$
						68.549	59.587	.962	44.57			$\Delta\delta = 44''.527$
						.533	.588	.945	44.49			$\Delta\rho = + 0''.012$
						.559	.615	.944	44.48			$r_1 = \pm 0''.061$
						.552	.610	.942	44.47			
	17	19	22	45.6	52.0	.564	.569	.995	44.74	+ 0.012		
Apr. 29	17	25	22	51.6	52.0	59.551	68.541	8.990	44.71	+ 0.012	2	Ill. A.
						.611	.550	.939	44.46			
						.617	.554	.937	44.45			
						.588	.560	.972	44.62			
						59.613	68.537	.924	44.38			$\tau = 15^h 6^m.9$
						68.568	59.581	.948	44.50			$\Delta\delta = 44''.511$
						.549	.582	.967	44.60			$\Delta\rho = + 0''.012$
						.551	.578	.973	44.63			$r_1 = \pm 0''.082$
						.550	.628	.922	44.30			
	17	57	23	23.6	51.0	.563	.639	.924	44.38	+ 0.012		
Apr. 30	17	46	23	12.8	49.0	68.556	59.584	8.972	44.62	+ 0.012	2	Ill. B.
						.536	.554	.920	44.67			
						.560	.580	.980	44.66			
						.572	.598	.974	44.63			
						68.570	59.586	.984	44.68			$\tau = 15^h 21^m.6$
						59.585	68.542	.957	44.55			$\Delta\delta = 44''.520$
						.629	.557	.928	44.41			$\Delta\rho = + 0''.012$
						.633	.524	.891	44.22			$r_1 = \pm 0''.108$
						.613	.541	.928	44.40			
	18	13	23	39.8	48.2	.604	.522	.918	44.36	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.	Temp.	Micr.	Micr	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.	
1881. Apr. 30	h.	m.	h.	m.	°	r.	r.	r.	"			
	18	14	23	40.8	48.2	68.554	59.628	8.926	44.40	+ 0.012	2	Ill. A.
						.561	.593	.968	44.60			
						.540	.579	.961	44.57			
						.551	.588	.963	44.58			
						68.564	59.610	.954	44.54			$\tau = 15^h 49^m.5$
	- 0 ^m .3					59.596	68.550	.954	44.53			$\Delta\delta = 44''.473$
						.614	.505	.891	44.22			$\Delta\rho = + 0''.012$
						.606	.517	.911	44.32			$r_1 = \pm 0''.086$
						.596	.528	.932	44.42			
	18	41	0	7.8	47.4	.585	.542	.957	44.55	+ 0.012		
May 6	17	56	23	23.2	56.2	68.578	59.600	8.978	44.65	+ 0.012	2	Ill. A. Cloudy.
						.538	.612	.926	44.40			
						.552	.591	.961	44.57			
						.523	.620	.903	44.28			
	+ 0 ^m .1					68.549	59.580	.969	44.61			$\tau = 15^h 10^m.3$
						59.642	68.533	.891	44.22			$\Delta\delta = 44''.442$
						.575	.530	.955	44.54			$\Delta\rho = + 0''.012$
						.612	.540	.928	44.40			$r_1 = \pm 0''.101$
						.629	.534	.905	44.29			
	18	27	23	54.2	55.8	.606	.546	.940	44.46	+ 0.012		
May 7	17	7	22	34.1	56.0	68.530	59.597	8.933	44.43	+ 0.012	3	Ill. A.
						.562	.586	.976	44.64			
						.545	.618	.927	44.40			
						.541	.602	.939	44.46			
						68.539	59.617	.922	44.38			$\tau = 14^h 10^m.5$
	0 ^m .0					39.579	68.544	.965	44.59			$\Delta\delta = 44''.481$
						.593	.520	.927	44.40			$\Delta\rho = + 0''.012$
						.601	.550	.949	44.51			$r_1 = \pm 0''.071$
						.613	.535	.922	44.37			
	17	24	23	51.1	56.0	.598	.572	.974	44.63	+ 0.012		
May 7	17	28	22	55.1	56.0	68.556	59.600	8.956	44.54	+ 0.012	3	Ill. B.
						.515	.620	.895	44.24			
						.558	.607	.951	44.52			
						.534	.598	.936	44.44			
	0 ^m .0					68.553	59.619	.934	44.44			$\tau = 14^h 37^m.4$
						59.606	68.561	.955	44.54			$\Delta\delta = 44''.464$
						.616	.542	.926	44.40			$\Delta\rho = + 0''.012$
						.602	.554	.952	44.52			$r_1 = \pm 0''.063$
						.609	.565	.956	44.54			
	17	57			55.2	.601	.541	.940	44.46	+ 0.012		
May 8	16	58	22	25.0	59.5	68.554	59.600	8.954	44.54	+ 0.012	3	Ill. A.
						.521	.630	.891	44.22			
						.527	.598	.929	44.41			
						.561	.614	.947	44.50			
						68.542	59.629	.913	44.33			$\tau = 13^h 59^m.5$
	- 0 ^m .11					59.611	68.549	.938	44.46			$\Delta\delta = 44''.448$
						.608	.539	.931	44.42			$\Delta\rho = + 0''.012$
						.589	.570	.981	44.67			$r_1 = \pm 0''.083$
						.627	.556	.929	44.41			
	17	19	22	46.0	59.0	.578	.528	.950	44.52	+ 0.012		
May 8	17	22	22	49.0	59.0	68.549	59.594	8.955	44.54	+ 0.012	3	Ill. B.
						.516	.619	.897	44.25			
						.574	.619	.955	44.54			
						.547	.618	.929	44.41			
	- 0 ^m .1					68.509	59.590	.919	44.36			$\tau = 14^h 20^m.4$
						59.607	68.552	.945	44.49			$\Delta\delta = 44''.509$
						.592	.570	.978	44.65			$\Delta\rho = + 0''.012$
						.590	.572	.982	44.67			$r_1 = \pm 0''.091$
						.592	.550	.958	44.55			
	17	49	23	16.0	58.5	.585	.558	.973	44.63	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	μ	$\Delta\mu$	$\Delta\rho$	Wt.	Remarks.
1881. May 25	h. m. 16 16	h. m. 21 18.3	64.5	r. 68.562 .549 .569 .544	r. 59.583 .599 .604 .584	r. 8.979 .950 .965 .960	44.66 44.52 44.59 44.56	+ 0.012	3	Ill. B. $\tau = 12^h 11^m.5$ $\Delta\delta = 44''.506$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.064$
	— 0 ^m .8			68.562 59.612 .614 .609	59.600 68.542 .540 .561	.962 .930 .926 .952	44.57 44.42 44.39 44.52			
	16 17	21 6.3	64.0	.620	.539	.919	44.36	+ 0.012		
May 25	16 43	21 9.3	64.0	68.544 .554 .534 .541	59.614 .623 .592 .620	8.930 .931 .942 .921	44.42 44.42 44.48 44.37	+ 0.012	3	Ill. A. $\tau = 12^h 38^m.0$ $\Delta\delta = 44''.434$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.048$
	— 0 ^m .8			68.532 59.616 .614 .610 .616	59.614 68.570 .564 .542 .564	.918 .954 .950 .932 .948	44.36 44.53 44.52 44.42 44.50			
	17 6	22 32.3	63.5	.612	.584	.910	44.32	+ 0.012		
May 26	16 25	21 51.3	62.8	68.558 .570 .559 .554	59.600 .581 .608 .600	8.958 .989 .951 .954	44.55 44.71 44.52 44.54	+ 0.012	4	Ill. B. $\tau = 12^h 14^m.6$ $\Delta\delta = 44''.530$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.069$
	— 0 ^m .8			68.566 59.615 .611 .590 .599	59.601 68.539 .559 .559 .552	.965 .924 .949 .969 .953	44.59 44.38 44.51 44.61 44.53			
	16 45	22 11.3	62.8	.628	.548	.920	44.36	+ 0.012		
May 26	16 13	22 14.3	62.8	68.539 .538 .527 .561	59.618 .609 .620 .610	8.921 .929 .907 .951	44.37 44.41 44.30 44.52	+ 0.012	3	Ill. A. $\tau = 12^h 37^m.0$ $\Delta\delta = 44''.440$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.054$
	— 0 ^m .8			68.552 59.607 .576 .606 .607	59.612 68.535 .542 .532 .561	.929 .928 .966 .926 .954	44.41 44.40 44.59 44.40 44.53			
	17 7	22 33.3	62.5	.605	.546	.941	44.47	+ 0.012		
May 27	16 34	22 0.2	67.0	68.560 .540 .554 .548	59.610 .598 .599 .621	8.950 .942 .955 .927	44.52 44.47 44.54 44.40	+ 0.012	3	Ill. A. $\tau = 12^h 20^m.0$ $\Delta\delta = 44''.466$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.055$
	— 0 ^m .8			68.544 59.598 .590 .608 .600	59.572 68.539 .531 .527 .519	.972 .941 .941 .919 .919	44.62 44.47 44.47 44.36 44.36			
	16 50	22 21.2	66.9	.586	.523	.937	44.45	+ 0.012		
May 27	16 58	22 24.2	66.9	68.562 .564 .562 .530	59.581 .577 .599 .586	8.981 .987 .963 .944	44.67 44.70 44.58 44.48	+ 0.012	3	Ill. B. $\tau = 12^h 45^m.0$ $\Delta\delta = 44''.598$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.055$
	— 0 ^m .8			68.552 59.617 .600 .571 .607	59.585 68.563 .581 .550 .556	.967 .946 .982 .979 .949	44.60 44.49 44.67 44.66 44.51			
	17 41	22 47.2	66.0	.586	.558	.972	44.62	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. May 28	h. m. 16 32	h. m. 21 58.2	° 70.2	r. 59.620	r. 68.552	r. 8.932	" 44.42	" + 0.012	3	Ill. A.
				.599	.551	.952	44.53			
				.596	.533	.937	44.45			
				.623	.569	.946	44.50			
	— 0 ^m .9			59.623	68.540	.917	44.35			$\tau = 12^h 12^m.1$
				68.569	59.600	.969	44.61			$\Delta\delta = 44''.537$
				.560	.596	.964	44.58			$\Delta\rho = + 0''.012$
				.581	.608	.973	44.63			$r_1 = \pm 0''.070$
				.551	.574	.977	44.65			
	16 49	22 15.2	70.0	.578	.600	.978	44.65	+ 0.012		
May 28	16 52	22 18.2	70.0	59.610	68.562	8.952	44.52	+ 0.012	3	Ill. B.
				.590	.549	.959	44.56			
				.593	.571	.978	44.65			
				.609	.542	.933	44.43			$\tau = 12^h 33^m.0$
	— 0 ^m .9			59.613	68.570	.957	44.55			$\Delta\delta = 44''.536$
				68.559	59.571	.988	44.70			$\Delta\rho = + 0''.012$
				.556	.604	.952	44.52			$r_1 = \pm 0''.061$
				.554	.618	.936	44.45			
				.559	.600	.959	44.56			
	17 11	22 37.2	69.9	.551	.621	.930	44.42	+ 0.012		
May 30	16 29	21 55.0	73.2	59.594	68.560	8.966	44.59	+ 0.012	4	Ill. B.
				.595	.576	.981	44.67			
				.605	.570	.965	44.59			
				.569	.543	.974	44.63			$\tau = 12^h 4^m.0$
	— 1 ^m .1			59.578	68.571	.993	44.73			$\Delta\delta = 44''.578$
				68.548	59.595	.953	44.53			$\Delta\rho = + 0''.012$
				.570	.583	.987	44.70			$r_1 = \pm 0''.077$
				.543	.622	.921	44.37			
				.532	.596	.936	44.44			
	16 52	22 18.0	73.0	.544	.592	.952	44.53	+ 0.012		
May 30	16 55	22 21.0	73.0	59.623	68.550	8.927	44.40	+ 0.011	3	Ill. A.
				.610	.557	.947	44.50			
				.600	.532	.932	44.42			
				.615	.547	.932	44.43			$\tau = 12^h 27^m.0$
	— 1 ^m .1			59.592	68.564	.972	44.62			$\Delta\delta = 44''.432$
				68.555	59.634	.921	44.37			$\Delta\rho = + 0''.011$
				.550	.622	.928	44.40			$r_1 = \pm 0''.055$
				.538	.616	.922	44.38			
				.512	.599	.913	44.33			
	17 12	22 38.0	73.0	.556	.615	.941	44.47	+ 0.011		
June 22	16 36	22 3.9	64.0	68.577	59.608	8.969	44.61	+ 0.012	2	Ill. B.
				.570	.625	.945	44.49			
				.542	.600	.942	44.48			
				.580	.622	.978	44.65			
				68.537	59.604	.933	44.43			$\tau = 10^h 41^m.0$
	— 2 ^m .2			59.588	68.560	.972	44.62			$\Delta\delta = 44''.574$
				.596	.539	.943	44.48			$\Delta\rho = + 0''.012$
				.596	.558	.962	44.57			$r_1 = \pm 0''.067$
				.566	.557	.991	44.72			
	17 2	22 26.9	63.5	.590	.575	.985	44.69	+ 0.012		
June 22	17 5	22 29.9	63.5	68.559	59.600	8.959	44.56	+ 0.012	2	Ill. A.
				.561	.623	.938	44.46			
				.567	.595	.972	44.62			
				.560	.580	.980	44.66			$\tau = 12^h 7^m.4$
				68.564	59.616	8.948	44.50			$\Delta\delta = 44''.572$
	— 2 ^m .2			59.600	68.602	9.002	44.77			$\Delta\rho = + 0''.012$
				.631	.574	8.943	44.48			$r_1 = \pm 0''.063$
				.604	.561	.957	44.55			
				.623	.591	.968	44.60			
	17 26	22 50.9	62.8	.615	.567	.952	44.52	+ 0.012		

Observations of α Lyrae and Companion—Continued.

Date.	Clock Time and Corr.		Hour Angle.	Temp.	Micr.	Micr.	Δ	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.	
1881.	h.	m.	h.	m.	r.	r.	r.		"			
June 26	15	49	21	13.7	75.4	68.571 .579 .582 .570 68.573 59.596 .584 .591 .583	59.599 .626 .634 .596 59.579 68.565 .560 .564 .586	8.972 .953 .948 .984 8.994 .969 .976 8.973 9.003	44.62 44.53 44.50 44.68 44.73 44.61 44.64 44.63 44.78	+ 0.012	3	Ill. B. $\tau = 9^h 38^m.2$ $\Delta\delta = 44''.639$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.056$
	— 2 ^m .4											
	16	15	21	39.7	74.8	.571	.553	8.982	44.67	+ 0.012		
June 26	16	20	21	44.7	74.8	68.533 .550 .560 .527 68.561 59.605 .600 .596 .586	59.568 .586 .613 .594 59.611 68.549 .555 .574 .540	8.965 .964 .947 .933 .950 .944 .946 .918 .954	44.59 44.58 44.50 44.43 44.52 44.48 44.50 44.36 44.54	+ 0.012	3	Ill. A. $\tau = 10^h 7^m.1$ $\Delta\delta = 44''.491$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.050$
	— 2 ^m .4											
	16	42	22	6.7	74.0	.618	.548	.930	44.41	+ 0.012		
June 28	16	30	21	54.6	81.5	68.590 .559 .563 .560 68.543 59.612 .603 .616 .610	59.593 .578 .596 .590 59.586 68.554 .587 .562 .564	8.997 .981 .967 .970 .957 .942 .984 .946 .954	44.75 44.67 44.60 44.61 44.55 44.48 44.68 44.49 44.54	+ 0.012	3	Ill. B. $\tau = 10^h 9^m.1$ $\Delta\delta = 44''.441$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.060$
	— 2 ^m .5											
	16	52	22	16.6	80.8	.599	.578	.979	44.66	+ 0.012		
June 28	16	56	22	20.6	80.8	68.552 .534 .522 .614 68.554 59.585 .584 .639 .607	59.610 .606 .597 .614 59.590 68.556 .534 .539 .525	8.942 .928 .925 .964 .964 .971 .950 .900 .918	44.48 44.40 44.39 44.58 44.58 44.62 44.52 44.27 44.36	+ 0.011	2	Ill. A. Images blurred. $\tau = 10^h 38^m.0$ $\Delta\delta = 44''.473$ $\Delta\rho = + 0''.011$ $r_1 = \pm 0''.077$
	— 2 ^m .5											
	17	24	22	48.6	79.2	.620	.574	.954	44.53	+ 0.011		
July 1	17	0	21	49.4	70.8	68.551 .546 .561 .534 68.552 59.600 .592 .631 .620	59.610 .631 .610 .612 59.612 68.518 .591 .565 .566	8.941 .915 .951 .922 .940 .918 .999 .934 .946	44.47 44.34 44.52 44.38 44.46 44.36 44.76 44.43 44.50	+ 0.012	2	Ill. A. Images blazing. $\tau = 9^h 52^m.1$ $\Delta\delta = 44''.465$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.079$
	— 2 ^m .7											
	16	47	22	11.4	69.7	.619	.552	.933	44.43	+ 0.012		
July 1	17	0	22	24.4	69.0	59.604 .614 .628 .606 59.616 68.591 .591 .628 .579	68.560 .579 .567 .580 68.579 59.626 .608 .580 .595	8.956 .965 .939 .974 .963 .965 8.983 9.048 8.984	44.54 44.59 44.46 44.63 44.58 44.59 44.68 45.00 44.68	+ 0.012	2	Ill. B. Images blazing. $\tau = 10^h 28^m.5$ $\Delta\delta = 44''.441$ $\Delta\rho = + 0''.012$ $r_1 = \pm 0''.100$
	— 2 ^m .7											
	17	25	22	49.4	68.0	.594	.594	9.000	44.76	+ 0.012		

Observations of α Lyræ and Companion—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. July 2	h. m. 16 35	h. m. 21 59.3	72.0	r. 68.544	r. 59.619	r. 8.925	'' 44.39	'' + 0.012	3	Ill. A.
				.561	.595	.966	44.59			
				.560	.612	.948	44.50			
				.572	.613	.959	44.56			
	— 2 ^m .8			68.554	59.610	.944	44.48			$\tau = 9^h 55^m.5$
				59.593	68.565	.972	44.62			$\Delta\delta = 44''.500$
				.637	.571	.934	44.44			$\Delta\rho = + 0''.012$
				.602	.568	.966	44.59			$\tau_1 = \pm 0''.063$
				.628	.541	.913	44.33			
	16 51	22 15.3	71.0	.606	.553	.947	44.50	+ 0.012		
July 2	16 54	22 18.3	71.0	68.560	59.615	8.945	44.49	+ 0.012	3	Ill. B.
				.568	.596	.972	44.62			
				.550	.627	.923	44.38			
				.567	.647	.920	44.36			
	— 2 ^m .8			68.566	59.601	.965	44.59			$\tau = 10^h 16^m.5$
				59.590	68.551	8.961	44.57			$\Delta\delta = 44''.560$
				.567	.568	9.001	44.77			$\Delta\rho = + 0''.012$
				.598	.580	8.982	44.67			$\tau_1 = \pm 0''.091$
				.580	.565	.985	44.69			
	17 15	22 39.3	70.0	.600	.539	.939	44.46	+ 0.012		

Observations of 61² Cygni and D. M. + 38°, 4345.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	Δ	$\Delta\delta$	$\Delta\mu$	Wt.	Remarks.
1885. Oct. 24	h. m. 22 0	h. m. 1 1.7	41.0	r. 44.213 .158 .135 .151	r. 84.004 84.010 83.971 84.003	r. 39.791 .852 .836 .852	197.91 198.21 198.13 198.21	+ 0.058	3	$\tau = 7^h 59^m.6$ $\Delta\delta = 198''.142$ $\Delta\rho = + 0''.058$ $r_1 = \pm 0''.082$
	+ 3 ^m .3			44.143 84.016 .005 .007 83.989 84.021	84.004 84.010 83.971 84.003	.820 .863 .807 .863 .849 .845	198.05 198.27 197.99 198.27 198.20 198.18	+ 0.058		
Oct. 25	21 28	0 29.7	46.5	83.990 .996 .998 .971	44.196 .198 .211 .202	39.794 .798 .787 .769	197.92 197.94 197.89 197.80	+ 0.058	3	$\tau = 7^h 59^m.7$ $\Delta\delta = 197''.870$ $\Delta\rho = + 0''.058$ $r_1 = \pm 0''.046$
	+ 3 ^m .3			44.200 .188 .209 .208 .196	83.961 83.956 84.012 83.994 .982	.784 .761 .768 .786 .786	197.87 197.76 197.79 197.88 197.88	+ 0.058		
Oct. 31	21 41	0 40.1	49.5	44.198 .194 .201 .200	83.961 .984 .972 .995	39.763 .790 .771 .795	197.77 197.90 197.81 197.93	+ 0.057	3	$\tau = 7^h 11^m.5$ $\Delta\delta = 197''.961$ $\Delta\rho = + 0''.057$ $r_1 = \pm 0''.058$
	+ 0 ^m .7			44.194 83.994 .176 83.990 84.029 83.997	83.972 44.176 .818 .165 .186 .180	.778 .818 .815 .825 .843 .817	197.84 198.04 198.05 198.08 198.17 198.04	+ 0.057		
Nov. 7	21 48	0 47.1	48.5	44.162 .183 .196 .183	84.002 83.988 .978 .989	39.840 .805 .782 .806	198.15 197.98 197.86 197.98	+ 0.057	2	$\tau = 7^h 15^m.1$ $\Delta\delta = 197''.950$ $\Delta\rho = + 0''.057$ $r_1 = \pm 0''.069$
	+ 0 ^m .7			44.182 83.985 .986 83.988 84.026 83.980	83.986 44.194 .215 .198 .203 .196	.804 .791 .771 .790 .823 .784	197.97 197.91 197.81 197.90 198.07 197.87	+ 0.057		
Nov. 8	22 3	1 2.2	51.0	44.230 .174 .193 .201	83.994 83.992 84.006 84.032	39.764 .818 .813 .831	197.77 198.04 198.02 198.11	+ 0.056	2	$\tau = 7^h 26^m.2$ $\Delta\delta = 198''.015$ $\Delta\rho = + 0''.056$ $r_1 = \pm 0''.092$
	+ 0 ^m .7			44.181 83.977 84.005 .973 .007 83.991	83.994 83.994 44.176 .139 .183 .191	.813 .801 .866 .790 .829 .800	198.02 197.96 198.28 197.90 198.10 197.95	+ 0.056		
Dec. 3	22 29	1 28.2	50.5	44.172 .191 .149 .143	83.996 83.983 84.001 83.977	39.824 .792 .852 .834	198.07 197.91 198.21 198.12	+ 0.059	3	$\tau = 5^h 48^m.7$ $\Delta\delta = 198''.043$ $\Delta\rho = + 0''.059$ $r_1 = \pm 0''.080$
	+ 2 ^m .3			44.182 83.993 .956 .984 .957 .961	83.992 44.160 .160 .133 .161 .161	.810 .833 .796 .851 .796 .795	198.00 198.12 197.93 198.21 197.93 197.93	+ 0.059		

Observations of 61² Cygni and D. M. + 38°, 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1880. Dec. 7	h. m. 22 27	h. m. 1 28.1	22.0	r. 44.174 .142 .182 .208 44.207	r. 83.987 84.029 .034 .035 84.010	r. 39.813 .887 .852 .827 803	" 198.02 198.39 198.21 198.09 197.97	" + 0.060 	3	$\tau = 5^h 30^m.4$ $\Delta\delta = 198''.106$ $\Delta\rho = + 0''.060$ $r_1 = \pm 0''.083$
	+ 2 ^m .7			83.997 84.004 83.996 84.020 83.999	44.171 .192 .179 .179 .172	.826 .812 .817 .841 .827	198.08 198.01 198.04 198.16 198.09	+ 0.060		
	22 45	1 46.1	21.5							
Dec. 9	23 4	2 5.3	22.7	44.158 .124 .133 .136 44.173	84.007 83.971 84.006 .012 84.000	39.849 .847 .873 .876 827	198.20 198.19 198.32 198.33 198.09	+ 0.061	2	$\tau = 6^h 0^m.7$ $\Delta\delta = 198''.120$ $\Delta\rho = + 0''.061$ $r_1 = \pm 0''.092$
	+ 2 ^m .9			83.983 .994 .970 .981 .979	44.189 .182 .156 .155 .162	.794 .812 .814 .826 .817	197.92 198.01 198.02 198.08 198.04	+ 0.061		
	23 24	2 25.3	22.2							
Dec. 11	22 25	1 26.4	28.1	84.022 83.994 .994 .996 83.998	44.169 .171 .168 .169 44.156	39.853 .823 .826 .827 842	198.22 198.07 198.08 198.09 198.16	+ 0.059	3	$\tau = 5^h 7^m.0$ $\Delta\delta = 198''.132$ $\Delta\rho = + 0''.059$ $r_1 = \pm 0''.032$
	+ 3 ^m .0			44.162 .160 .178 .149 .166	83.994 84.003 84.016 83.982 84.008	.832 .843 .838 .833 .842	198.11 198.17 198.14 198.12 198.16	+ 0.059		
	23 31	1 32.4	27.2							
Dec. 13	23 16	2 17.6	39.5	44.194 .125 .127 .169 44.150	83.980 84.001 83.980 84.017 83.974	39.786 .876 .853 .848 824	197.88 198.33 198.22 198.19 198.07	+ 0.060	2	$\tau = 5^h 56^m.7$ $\Delta\delta = 198''.114$ $\Delta\rho = + 0''.060$ $r_1 = \pm 0''.085$
	+ 3 ^m .2			83.975 83.980 84.009 83.980 .984	44.162 .144 .161 .160 .162	.813 .836 .848 .820 .822	198.02 198.13 198.19 198.05 198.06	+ 0.060		
	23 35	2 36.6	39.0							
Dec. 15	23 3	2 4.7	41.0	44.142 .124 .140 .140 44.148	83.984 .990 .971 .981 83.983	39.842 .866 .831 .841 836	198.16 198.28 198.11 198.16 198.13	+ 0.057	2	$\tau = 5^h 37^m.5$ $\Delta\delta = 198''.128$ $\Delta\rho = + 0''.058$ $r_1 = \pm 0''.061$
	+ 3 ^m .3			83.988 .989 .980 83.998 84.000	44.179 .170 .170 .150 .151	.809 .819 .810 848 849	198.00 198.05 198.00 198.19 198.20	+ 0.058		
	23 25	2 26.7	40.3							
1881. Jan. 12	1 17	4 15.4	28.5	44.124 .120 .160 .134 44.121	84.016 3.993 .963 3.993 84.002	39.892 .873 .803 .859 881	198.41 198.32 197.97 198.25 198.36	+ 0.070	3	Images very good at times, but became poor. $\tau = 5^h 59^m.2$ $\Delta\delta = 198''.322$ $\Delta\rho = + 0''.074$ $r_1 = \pm 0''.094$
	+ 0 ^m .0			83.993 84.014 84.006 83.984 84.000	44.124 .117 .131 .099 .098	.869 .897 .875 885 .902	198.30 198.44 198.33 198.38 198.46	+ 0.077		
	1 42	4 40.4	28.0							

Observations of 61² Cygni and D. M. + 38^o, 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881	h. m.	h. m.	r.	r.	r.					
Jan. 13	1 25	4 46.5	25.0	44.117 .090 .160 .102 44.140 83.981 84.020 83.982 83.974 84.023	84.037 .008 (.000) .840 84.030 83.980 44.073 .088 .124 .138 .078	39.920 .918 .840 .928 .840 .908 .932 .858 .836 .945	198.55 198.54 198.15 198.59 198.15 198.49 198.61 198.24 198.13 198.68	+ 0.071	2	Very windy and telescope much shaken. $\tau = 5^h 57^m.4$ $\Delta\delta = 198''.413$ $\Delta\rho = + 0''.074$ $r_1 = \pm 0''.149$
Jan. 17	1 25	4 23.7	31.0	44.100 .137 .111 .144 44.114 83.974 83.980 84.000 83.979 83.980	84.004 83.977 84.019 (.000) 84.041 44.070 .101 .118 .111 .092	39.904 .840 .908 .877 .927 .904 .879 .882 .868 .888	198.47 198.15 198.49 198.34 198.58 198.47 198.35 198.36 198.29 198.39	+ 0.073	3	$\tau = 5^h 45^m.8$ $\Delta\delta = 198''.389$ $\Delta\rho = + 0''.076$ $r_1 = \pm 0''.082$
Jan. 19	2 11	5 9.7	31.0	84.045 .035 .035 83.992 84.031 44.156 .131 .057 .046 .122	44.122 .123 .142 .101 44.120 83.961 .960 .910 .974 .989	39.923 .912 .893 .891 .909 .805 .829 .853 .928 .867	198.56 198.51 198.42 198.41 198.50 197.98 198.10 198.22 198.59 198.29	+ 0.091	2	Comp. faint after reversal; cloudy. $\tau = 6^h 26^m.3$ $\Delta\delta = 198''.358$ $\Delta\rho = + 0''.100$ $r_1 = \pm 0''.139$
Jan. 22	1 48	4 46.8	35.8	83.997 84.023 83.998 84.050 83.977 44.090 .092 .092 .103 .110	44.060 .117 .140 .129 44.086 84.025 83.985 .950 .978 .995	39.937 .906 .858 .921 .891 .935 .893 .858 .875 .885	198.64 198.48 198.24 198.31 198.41 198.62 198.42 198.24 198.33 198.38	+ 0.080	2	$\tau = 5^h 50^m.2$ $\Delta\delta = 198''.431$ $\Delta\rho = + 0''.085$ $r_1 = \pm 0''.096$
Jan. 26	2 11	5 9.8	35.0	44.104 .113 .146 .136 44.128 83.981 .980 .984 83.972 84.010	84.041 83.976 84.009 84.023 84.013 44.095 .106 .138 .094 .110	39.937 .863 .863 .887 .885 .886 .874 .846 .878 .900	198.64 198.27 198.27 198.39 198.38 198.38 198.32 198.18 198.34 198.45	+ 0.090		
Jan. 26	2 11	5 3.0	34.5	44.104 .113 .146 .136 44.128 83.981 .980 .984 83.972 84.010	84.041 83.976 84.009 84.023 84.013 44.095 .106 .138 .094 .110	39.937 .863 .863 .887 .885 .886 .874 .846 .878 .900	198.64 198.27 198.27 198.39 198.38 198.38 198.32 198.18 198.34 198.45	+ 0.085	3	$\tau = 5^h 49^m.6$ $\Delta\delta = 198''.362$ $\Delta\rho = + 0''.092$ $r_1 = \pm 0''.084$
Jan. 28	2 11	5 10.1	26.5	44.070 .095 .135 .078 44.110 84.017 83.979 .990 .993 .990	83.963 84.008 84.003 83.999 84.014 44.110 .107 .107 .122 .081	39.893 .913 .868 .921 .904 44.110 .907 .872 .880 .909	198.42 198.49 198.29 198.55 198.47 198.49 198.31 198.35 198.31 198.50	+ 0.094	3	$\tau = 5^h 47^m.4$ $\Delta\delta = 198''.421$ $\Delta\rho = + 0''.101$ $r_1 = \pm 0''.066$
	2 48	5 28.1	25.2	.990	.081	.909	198.50	+ 0.108		

Observations of 61² Cygni and D. M. + 38°, 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881, Mar. 14	h. m. 16 36	h. m. 19 33.3	32.8	r. 84.104 .060 .112 .041	r. 44.097 .118 .090 .091	r. 40.007 39.942 40.022 39.950	" 198.98 198.66 199.06 198.70	" + 0.073	2	$\tau = 17^h. 19^m.2$ $\Delta\delta = 198''.829$ $\Delta\rho = + 0''.069$ $r_1 = \pm 0''.107$
	— 1 ^{m.1}			84.087 44.080 .080 .096 .073 .110	44.077 84.083 .037 .049 .054 .049	40.010 40.003 39.957 .953 1981 .939	199.00 198.96 198.73 198.71 198.85 198.64	+ 0.065		
	17 10	20 7.3	32.2							
Mar. 15	16 26	19 23.2	38.0	84.126 .129 .070 .134	44.072 .067 .082 .047	40.054 40.062 39.988 40.087	199.22 199.26 198.89 199.38	+ 0.073	2	
	— 1 ^{m.2}			84.150 44.040 .018 .074 .033 .102	44.059 84.041 .063 .051 .069 .061	40.091 40.001 40.045 39.977 40.036 39.959	199.40 198.95 199.17 198.83 199.13 198.74	+ 0.067		
	16 56	19 53.2	38.0							
Mar. 21	16 54	19 50.7	34.2	84.095 .053 .072 .079	44.061 .075 .095 .090	40.034 39.978 .977 .989	199.12 198.84 198.83 198.89	+ 0.067	2	
	— 1 ^{m.7}			84.052 44.063 .028 .040 .044 .041	44.114 84.066 .063 .077 .081 .072	39.938 40.003 .035 .037 .045 .031	198.64 198.96 199.12 199.13 199.17 199.10	+ 0.063		
	17 20	20 16.7	33.8							
Mar. 23	16 53	19 49.6	32.6	84.101 .080 .064 .114	44.052 .035 .029 .087	40.049 .045 .035 .027	199.19 199.17 199.12 199.08	+ 0.067	2	
	— 1 ^{m.8}			84.092 44.040 .030 .049 .028 .004	44.040 84.104 .130 .120 .090 .118	.052 .064 .100 .071 .062 .114	199.21 199.27 199.44 199.30 199.26 199.52	+ 0.063		
	17 21	20 17.6	32.2							
Mar. 26	17 12	20 8.4	31.0	84.056 .010 .042 .064	44.070 .082 .051 .084	39.986 .928 .991 39.980	198.88 198.59 198.90 198.85	+ 0.064	2	
	— 2 ^{m.0}			84.080 44.080 .076 .044 .058 .062	44.039 84.083 .069 .049 .076 .039	40.041 40.003 39.993 40.005 40.018 39.977	199.15 198.96 198.91 198.97 199.04 198.83	+ 0.062		
	17 40	20 36.4	30.8							
Mar. 27	17 9	20 5.3	32.7	84.150 .099 .156 .142	44.050 .060 .085 .048	40.100 .039 .071 .094	199.44 199.14 199.30 199.42	+ 0.064	2	
	— 2 ^{m.1}			84.098 44.059 .036 .046 .042 .019	44.088 84.081 .056 .050 .099 .056	.010 .022 .020 .004 .057 .037	199.00 199.06 199.05 198.97 199.23 199.13	+ 0.062		
	17 35	20 31.3	32.6							
										$\tau = 16^h. 57^m.1$ $\Delta\delta = 199''.256$ $\Delta\rho = + 0''.065$ $r_1 = \pm 0''.092$
										$\tau = 16^h. 4^m.1$ $\Delta\delta = 198''.908$ $\Delta\rho = + 0''.063$ $r_1 = \pm 0''.099$
										$\tau = 16^h. 56^m.1$ $\Delta\delta = 199''.174$ $\Delta\rho = + 0''.063$ $r_1 = \pm 0''.113$

Observations of 61² Cygni and D. M. + 38°, 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1891.	h. m.	h. m.		r.	r.	r.				
Apr. 27	18 49	21 43.0	55.5	84.138	44.039	40.099	199.44	+ 0.057		
				.126	.046	.080	199.35			
				.133	.052	.081	199.35			$\tau = 16^h 27^m.1$
				.128	.060	.068	199.29			$\Delta\delta = 199''.373$
				84.113	44.043	.070	199.30			$\Delta\rho = + 0''.000$
	- 0 ^m .4			44.034	84.135	.101	199.45			$r_1 = \pm 0''.056$
				.070	.164	.091	199.42			
				.054	.120	.066	199.28			
				.054	.129	.075	199.32			
	19 00	20 01.0	55.3	.031	.149	.118	199.53	+ 0.056		
Apr. 29	18 18	21 12.9	50.8	84.113	44.020	40.093	199.41	+ 0.057		
				.114	.058	.056	199.23			
				.121	.061	.120	199.54			
				.069	.037	.032	199.11			$\tau = 16^h 57^m.0$
	- 0 ^m .5			84.145	44.041	.104	199.46			$\Delta\delta = 199''.335$
				44.056	84.099	.043	199.16			$\Delta\rho = + 0''.057$
				.081	.136	.055	199.22			$r_1 = \pm 0''.000$
				.019	.131	.112	199.50			
				.031	.120	.089	199.39			
	18 40	21 37.9	50.2	.060	.136	.076	199.33	+ 0.057		
Apr. 30	18 46	21 44.1	47.0	84.154	44.045	40.109	199.49	+ 0.058		
				.159	.038	.121	199.55			
				.148	.029	.119	199.54			$\tau = 16^h 17^m.9$
				.152	.025	.127	199.58			$\Delta\delta = 199''.466$
				84.114	44.056	.058	199.24			$\Delta\rho = + 0''.000$
	- 0 ^m .3			44.062	84.174	.112	199.50			$r_1 = \pm 0''.072$
				.041	.149	.108	199.49			
				.040	.117	.077	199.33			
				.024	.140	.116	199.52			
	19 00	22 4.1	46.5	.034	.129	.095	199.42	+ 0.057		
May 6	18 38	21 33.5	55.8	84.137	44.009	40.128	199.58	+ 0.057		
				.119	.030	.089	199.39			
				.144	.021	.123	199.56			
				.120	.015	.105	199.47			$\tau = 15^h 45^m.3$
				84.167	44.020	.147	199.68			$\Delta\delta = 199''.554$
	+ 0 ^m .1			44.019	84.165	.140	199.67			$\Delta\rho = + 0''.057$
				.019	.139	.100	199.54			$r_1 = \pm 0''.061$
				.012	.150	.138	199.63			
				.020	.133	.110	199.49			
	18 50	21 56.5	55.0	.032	.149	.117	199.53	+ 0.057		
May 7	18 4	21 2.4	55.1	84.155	44.007	40.148	199.68	+ 0.058		
				.169	43.978	.191	199.90			
				.148	44.017	.131	199.60			
				.100	.014	.146	199.67			$\tau = 15^h 8^m.8$
	- 0 ^m .0			84.145	44.025	.120	199.54			$\Delta\delta = 199''.627$
				44.021	84.132	.111	199.50			$\Delta\rho = + 0''.058$
				.100	.139	.110	199.49			$r_1 = \pm 0''.081$
				44.005	.129	.124	199.56			
				43.998	.133	.135	199.62			
	18 24	21 22.4	54.8	.099	.152	.153	199.71	+ 0.058		
May 8	17 57	20 55.3	58.2	84.126	44.006	40.120	199.54	+ 0.058		
				.100	.019	.101	199.45			
				.100	.014	.100	199.40			$\tau = 14^h 57^m.8$
				.144	.008	.136	199.62			$\Delta\delta = 199''.490$
	- 0 ^m .1			84.144	44.018	.126	199.58			$\Delta\rho = + 0''.058$
				44.042	84.138	.096	199.43			$r_1 = \pm 0''.058$
				.036	.153	.117	199.53			
				.037	.100	.101	199.45			
				.030	.151	.121	199.55			
	18 17	21 10.3	58.0	.040	.121	.081	199.35	+ 0.057		

Observations of 61² Cygni and D. M. + 38° 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. May 25	h. m. 17 14	h. m. 20 11.6	° 63.0	r. 84.193 .192 .186 .205	r. 44.046 .046 .026 .047	r. 40.147 .146 .160 .158	" 199.68 199.67 199.74 199.73	" + 0.062	3	$\tau = 13^h 7^m.9$ $\Delta\delta = 199''.735$ $\Delta\rho = + 0''.060$ $r_1 = \pm 0''.079$
	- 0 ^m .8			84.179 43.982 44.002 43.961 44.014 44.043	44.012 84.180 .140 .141 .192 .159	.167 .198 .138 .180 .178 .116	199.78 199.73 199.63 199.84 199.83 199.52	+ 0.060		
May 26	17 35	20 32.6	62.6							
	17 15	20 12.6	62.3	84.200 .181 .188 .238	43.990 43.960 44.037 44.006	40.210 .221 .151 .232	199.99 200.05 199.70 200.10	+ 0.062	2	$\tau = 13^h 6^m.1$ $\Delta\delta = 199''.951$ $\Delta\rho = + 0''.060$ $r_1 = \pm 0''.099$
	- 0 ^m .8			84.210 43.982 .988 43.996 44.019 43.966	43.957 84.175 .176 .203 .199 .147	.253 .193 .188 .207 .180 .181	200.21 199.91 199.88 199.98 199.84 199.85	+ 0.059		
May 27	17 36	20 35.6	61.7							
	17 28	20 25.5	65.9	84.187 .181 .195 .167	43.989 44.003 43.990 44.015	40.198 .178 .205 .152	199.93 199.83 199.97 199.70	+ 0.060	3	$\tau = 13^h 15^m.9$ $\Delta\delta = 199''.794$ $\Delta\rho = + 0''.059$ $r_1 = \pm 0''.091$
	- 0 ^m .9			84.192 43.996 44.016 44.021 43.972 44.011	44.001 84.139 .167 .153 .172 .165	.191 .143 .151 .132 .200 .154	199.90 199.66 199.70 199.60 199.94 199.71	+ 0.058		
May 28	17 53	20 50.5	65.0							
	17 17	20 14.5	69.9	44.008 44.001 43.982 43.981	84.154 .183 .196 .176	40.146 .182 .214 .195	199.67 199.85 200.01 199.92	+ 0.060	3	$\tau = 12^h 58^m.0$ $\Delta\delta = 199''.852$ $\Delta\rho = + 0''.059$ $r_1 = \pm 0''.075$
	- 0 ^m .9			44.022 84.181 .205 .159 .173 43.977	84.177 43.982 44.010 44.002 43.977 43.984	.155 .199 .195 .157 .196 .180	199.72 199.94 199.92 199.73 199.92 199.84	+ 0.058		
May 30	17 36	20 33.5	69.5							
	17 18	20 15.3	73.0	43.990 .978 .999 .987	84.180 .192 .210 .188	40.190 .214 .211 .201	199.89 200.01 200.00 199.95	+ 0.060	2	$\tau = 12^h 52^m.4$ $\Delta\delta = 199''.955$ $\Delta\rho = + 0''.059$ $r_1 = \pm 0''.105$
	- 1 ^m .1			43.979 84.169 .160 .198 .156 43.978	84.189 43.960 .998 43.930 44.003 43.970	.210 .209 .162 .268 .153 .208	199.99 199.99 199.75 200.28 199.71 199.98	+ 0.058		
June 26	17 40	20 37.3	72.9							
	18 15	21 11.0	72.0	84.238 .180 .220 .211	43.973 44.015 43.978 .992	40.265 .165 .242 .219	200.27 199.77 200.15 200.04	+ 0.057	3	$\tau = 12^h 59^m.8$ $\Delta\delta = 200''.130$ $\Delta\rho = + 0''.057$ $r_1 = \pm 0''.101$
	- 2 ^m .4			84.183 43.969 .966 .995 .954 43.978	43.949 84.225 .228 .220 .199 .240	.234 .250 .262 .225 .245 .262	200.11 200.22 200.25 200.07 200.17 200.25	+ 0.056		

Observations of 61² Cygni and D. M. + 38°, 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. June 28	h. m. 18 15	h. m. 21 10.9	79.0	r. 84.191 .270 .211 .171	r. 43.959 44.050 43.923 43.980	r. 40.232 .220 .288 .191	" 200.00 200.04 200.38 199.90	+ 0.055	2	Images blazing and unsteady.
	— 2 ^m .5			84.228 43.920 .979 .920 .958	.223 84.210 .250 .309 .223	.220 200.39 200.30 200.49 200.27				$\tau = 11^h 55^m.3$ $\Delta\delta = 200''.231$ $\Delta\rho = + 0''.054$ $r_1 = \pm 0''.130$
	18 40	21 10.9	78.8	.928	.217	.289	200.38	+ 0.054		
July 1	18 7	21 2.7	67.2	84.254 .250 .184 .206	43.951 .950 .950 .970	40.303 .300 .234 .236	200.46 200.44 200.11 200.12	+ 0.056	2	
	— 2 ^m .7			84.251 43.958 43.960 44.000 43.960	43.961 84.229 .210 .235 .250	.290 .271 .250 200.12 200.39	200.39 200.30 200.19 200.12 200.39			$\tau = 11^h 33^m.4$ $\Delta\delta = 200''.259$ $\Delta\rho = + 0''.055$ $r_1 = \pm 0''.103$
	18 28	21 23.7	66.9	.963	.189	.226	200.07	+ 0.055		
July 2	18 4	20 59.6	69.3	84.233 .234 .210 .205	43.946 .951 .960 .965	40.287 .283 .250 .240	200.38 200.36 200.19 200.14	+ 0.056	3	
	— 2 ^m .8			84.224 43.969 .966 .983 .956	43.968 84.203 .186 .216 .230	.256 .234 .220 .233 .274	200.22 200.11 200.04 200.11 200.31			$\tau = 11^h 26^m.3$ $\Delta\delta = 200''.209$ $\Delta\rho = + 0''.055$ $r_1 = \pm 0''.077$
	18 25	21 20.6	68.2	.943	.201	.258	200.23	+ 0.055		
July 19	21 33	0 31.0	68.6	43.960 .933 .941 .928	84.251 .275 .262 .220	40.291 .342 .321 .352	200.39 200.65 200.55 200.70	+ 0.054	2	Clouds after first set; the second set com- menced at 21 ^h 55 ^m .
	— 2 ^m .4			43.944 84.218 .248 .221 .298	84.269 43.914 .910 .897 .910	.325 .304 .338 .324 .388	200.56 200.46 200.63 200.56 200.88			$\tau = 13^h 59^m.3$ $\Delta\delta = 200''.595$ $\Delta\rho = + 0''.054$ $r_1 = \pm 0''.090$
	21 15	1 9.0	68.2	.225	.899	.326	200.57	+ 0.054		
July 21	21 35	0 33.0	72.2	84.225 .268 .227 .212	43.942 .953 .961 .946	40.283 .315 .266 .266	200.36 200.52 200.27 200.27	+ 0.054	2	
	— 0 ^m .4			84.218 43.946 .922 .946 .917	43.944 84.243 .223 .201 .237	.274 .297 .301 .255 .320	200.31 200.42 200.44 200.22 200.54			$\tau = 13^h 46^m.9$ $\Delta\delta = 200''.386$ $\Delta\rho = + 0''.054$ $r_1 = \pm 0''.079$
	21 1	0 59.0	71.9	.933	.248	.315	200.51	+ 0.054		
July 23	21 20	0 17.9	69.0	43.916 .969 .919 .928	84.219 .207 .233 .214	40.303 .238 .314 .306	200.46 200.13 200.31 200.47	+ 0.054	2	
	— 2 ^m			43.958 84.243 .257 .222 .240	84.232 43.957 .946 .969 .991	.274 286 .311 .253 .328	200.31 200.37 200.49 200.21 200.58			$\tau = 13^h 24^m.0$ $\Delta\delta = 200''.373$ $\Delta\rho = + 0''.054$ $r_1 = \pm 0''.103$
	21 46	1 0	68.7	.220	.991	.251	200.20	+ 0.054		

Observations of 61^a Cygni and D. M. + 38°, 4345—Continued.

Date.	Clock Time and Corr.		Hour Angle.		Temp.	Micr.		$2\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. July 24	h. m.		h. m.			r.	r.	r.	"	"		
	21 21		0 18.9		71.3	84.233	43.923	40.310	200.49	+ 0.054	3	
						.243	.957	.286	200.37			
						.224	.920	.304	200.46			
						.234	.926	.308	200.48			
						84.253	43.915	.338	200.63			$\tau = 13^h 19^m.1$
	— 0 ^m .5					43.934	84.237	.303	200.45			$\Delta\delta = 200''.450$
						.940	.230	.290	200.39			$\Delta\rho = + 0''.054$
						.946	.230	.284	200.36			$r_1 = \pm 0''.052$
						.934	.232	.298	200.43			
	21 43		0 40.9		71.0	.925	.225	.300	200.44	+ 0.054		
July 25	21 20		0 17.8		75.0	84.249	43.922	40.327	200.57	+ 0.054	3	
						.238	.942	.296	200.42			
						.251	.938	.313	200.50			
						.250	.935	.315	200.52			
						84.266	43.953	.313	200.50			$\tau = 13^h 14^m.1$
	— 0 ^m .6					43.928	84.197	.269	200.29			$\Delta\delta = 200''.465$
						.930	.232	.302	200.45			$\Delta\rho = + 0''.054$
						.934	.238	.304	200.46			$r_1 = 0''.051$
						.955	.261	.306	200.47			
	21 42		0 39.8		74.8	.927	.232	.305	200.47	+ 0.054		
July 28	21 40		0 37.7		66.0	43.906	84.258	40.352	200.70	+ 0.054	2	
						.890	.226	.336	200.62			
						.917	.273	.356	200.72			
						.902	.227	.325	200.56			
						43.907	84.240	.335	200.61			$\tau = 13^h 24^m.5$
	— 0 ^m .7					84.242	43.972	.270	200.29			$\Delta\delta = 200''.530$
						.230	.925	.305	200.47			$\Delta\rho = + 0''.054$
						.233	.943	.290	200.39			$r_1 = \pm 0''.092$
						.241	.939	.302	200.45			
	22 7		0 4.7		65.8	.253	.943	.310	200.49	+ 0.054		
Aug. 22	21 14		0 10.8		71.5	84.267	43.895	40.372	200.80	+ 0.054	2	
						.230	.908	.322	200.55			
						.275	.873	.402	200.95			
						.247	.878	.369	200.78			
	— 1 ^m .6					84.246	43.905	.341	200.64			$\tau = 11^h 18^m.0$
						43.896	84.238	.342	200.65			$\Delta\delta = 200''.722$
						.890	.229	.339	200.63			$\Delta\rho = + 0''.054$
						.864	.225	.361	200.74			$r_1 = \pm 0''.076$
						.872	.241	.369	200.78			
	21 38		0 34.8		71.0	.901	.253	.352	200.70	+ 0.054		
Aug. 23	19 24		22 20.8		73.6	43.911	84.265	40.354	200.71	+ 0.054	2	
						.927	.272	.345	200.66			
						.900	.277	.377	200.82			
						.908	.261	.353	200.70			
	— 1 ^m .6					43.887	84.272	.385	200.86			$\tau = 9^h 22^m.4$
						84.250	43.863	.387	200.87			$\Delta\delta = 200''.720$
						.195	.894	.301	200.45			$\Delta\rho = + 0''.054$
						.261	.913	.348	200.68			$r_1 = \pm 0''.082$
						.249	.885	.364	200.76			
	19 44		22 49.6		72.0	.277	.926	.351	200.69	+ 0.054		
Aug. 24	19 32		22 28.8		75.5	84.272	43.910	40.362	200.75	+ 0.054	2	
						.256	.924	.332	200.60			
						.284	.899	.385	200.86			
						.263	.919	.344	200.66			
						84.241	43.878	.363	200.75			$\tau = 9^h 27^m.4$
	— 1 ^m .0					43.923	84.240	.317	200.52			$\Delta\delta = 200''.687$
						.966	.236	.336	200.62			$\Delta\rho = + 0''.054$
						.904	.262	.358	200.73			$r_1 = \pm 0''.071$
						.899	.230	.331	200.59			
	19 54		22 50.8		74.6	.902	.272	.370	200.79	+ 0.054		

Observations of 61² Cygni and D. M. + 38° 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	Δz	Δw	Δp	Wt.	Remarks.
1881.	h. m.	h. m.		r.	r.	r.				
Aug. 25	19 11	22 27.8	74.0	41.879 .928 .920 43.920	84.260 .264 .287 84.260	40.381 .336 .384 40.381	200.84 200.62 200.86 200.64	+ 0.054	2	$\tau = 9^h 1^m$ $\Delta\delta = 200''.691$ $\Delta\rho = + 0''.054$ $r_1 = \pm 0''.073$
	19 14			.257 .251 .241	.918 .921 84.43	.339 .330 43.888	200.63 200.59 200.59			
	19 21	22 27.8	73.5	.267	.891	.376	200.82	+ 0.054		
Aug. 26	19 33	22 29.8	73.0	84.297 .253 .284 .255	43.910 .907 .902 .932	40.387 .346 .382 .323	200.87 200.67 200.85 200.56	+ 0.054	2	$\tau = 9^h 20^m$ $\Delta\delta = 200''.707$ $\Delta\rho = + 0''.054$ $r_1 = \pm 0''.082$
	19 56			84.290 43.906 .910 .891	43.926 84.260 .264 .238	.364 .354 .347	200.76 200.71 200.71 200.67			
	19 55	22 51.8	71.9	.948 .889	.255 .259	.307 .370	200.48 200.79	+ 0.054		
Sept. 5	20 00	0 56.5	84.7	84.275 .266 .272 .271	43.920 .909 .901 .894	40.355 .357 .371 .377	200.71 200.72 200.79 200.82	+ 0.053	3	$\tau = 11^h 7^m$ $\Delta\delta = 200''.735$ $\Delta\rho = + 0''.053$ $r_1 = \pm 0''.035$
	20 09			84.280 43.898 .906 .900	43.916 84.251 .262 .241	.364 .353 .356 .341	200.76 200.70 200.72 200.64			
	22 22	1 18.5	84.2	.887 .894	.253 .250	.366 .356	200.77 200.72	+ 0.053		
Sept. 6	19 51	22 47.1	81.8	84.251 .252 .278 .243	43.881 .901 .901 .908	40.370 .351 .357 .335	200.79 200.69 200.72 200.61	+ 0.053	3	$\tau = 8^h 54^m$ $\Delta\delta = 200''.712$ $\Delta\rho = + 0''.053$ $r_1 = \pm 0''.042$
	20 04			84.268 43.911 .908 .892	43.909 84.250 .257 .262	.359 .339 .349 .370	200.73 200.63 200.68 200.79			
	20 12	23 2.1	81.2	.897 .911	.263 .265	.366 .354	200.77 200.71	+ 0.053		
Sept. 24	19 22	22 17.8	81.0	84.280 .278 .260 .291	43.907 .923 .893 .910	40.373 .355 .367 .381	200.80 200.71 200.77 200.84	+ 0.053	4	$\tau = 7^h 12^m$ $\Delta\delta = 200''.788$ $\Delta\rho = + 0''.053$ $r_1 = \pm 0''.039$
	19 56			84.308 43.926 .934 .920	43.918 84.280 .296 .293	.390 .354 .362 .373	200.89 200.71 200.75 200.80			
	19 39	22 34.8	80.0	.921 .919	.302 .286	.381 .367	200.84 200.77	+ 0.053		
Sept. 26	19 23	22 17.7	84.7	84.262 .310 .279 .299	43.915 .909 .924 .908	40.347 .401 .355 .391	200.67 200.94 200.71 200.89	+ 0.053	2	$\tau = 7^h 4^m$ $\Delta\delta = 200''.881$ $\Delta\rho = + 0''.053$ $r_1 = \pm 0''.088$
	19 56			84.294 43.892 .889 .882	43.912 84.306 .291 .313	.382 .414 .402 .431	200.85 201.01 200.95 201.09			
	19 39	22 34.7	83.8	.911 .898	.281 .292	.370 .394	200.79 200.91	+ 0.053		

Observations of 61² Cygni and D. M. + 38° 4345—Continued.

Date.	Clock Time and Corr.		Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\epsilon$	$\Delta\rho$	Wt.	Remarks.
1881. Sept. 27	h.	m.	h.	m.	r.	r.	r.	r.	r.		
	21	59	0	54.7	80.0	84.273	43.909	40.364	200.76	+ 0.053	2
						.262	.918	.344	200.66		
						.265	.925	.340	200.64		
						.264	.904	.360	200.74		
						84.288	43.898	.390	200.89		$\tau = 9^h 40^m.2$
	— 2 ^m .7					43.927	84.292	.365	200.76		$\Delta\delta = 200''.826$
						.893	.308	.415	201.01		$\Delta\rho = + 0''.053$
						.893	.276	.383	200.85		$r_1 = \pm 0''.090$
						.893	.300	.407	200.97		
	22	23	1	28.7	80.0	.891	.300	.409	200.98	+ 0.053	
Sept. 29	22	10	1	27.6	78.8	43.922	84.315	40.393	200.90	+ 0.053	2
						.908	.302	.394	200.91		
						.905	.294	.389	200.88		
						.915	.303	.388	200.88		
						43.918	84.297	.379	200.83		$\tau = 9^h 42^m.2$
	— 2 ^m .8					84.307	43.905	.402	200.95		$\Delta\delta = 200''.884$
						.296	.908	.388	200.88		$\Delta\rho = + 0''.053$
						.307	.930	.377	200.82		$r_1 = \pm 0''.031$
						.306	.904	.402	200.95		
	22	32	1	27.6	78.5	.305	.925	.380	200.84	+ 0.053	
Oct. 22	22	11	1	9.2	58.2	43.885	84.272	40.387	200.87	+ 0.055	3
						.880	.274	.394	200.91		
						.900	.290	.390	200.89		
						.882	.282	.400	200.94		
	— 0 ^m .2					43.884	84.269	.385	200.86		$\tau = 8^h 15^m.9$
						84.275	43.870	.405	200.96		$\Delta\delta = 200''.943$
						.298	.875	.423	201.05		$\Delta\rho = + 0''.055$
						.293	.862	.431	201.09		$r_1 = \pm 0''.053$
						.271	.863	.408	200.98		
	22	34	1	32.2	57.7	.266	.877	.389	200.88	+ 0.055	
Oct. 26	22	29	1	27.2	53.2	43.923	84.305	40.382	200.85	+ 0.056	2
						.900	.315	.415	201.01		Images blazing.
						.902	.307	.405	200.96		
						.884	.314	.430	201.09		
						43.904	84.292	.388	200.88		$\tau = 8^h 17^m.1$
	— 0 ^m .2					84.291	43.887	.404	200.96		$\Delta\delta = 200''.996$
						.318	.890	.428	201.08		$\Delta\rho = + 0''.056$
						.294	.884	.410	200.99		$r_1 = \pm 0''.072$
						.289	.891	.398	200.93		
	22	50	1	48.2	53.0	.315	.861	.454	201.21	+ 0.056	
Oct. 27	22	33	1	31.2	55.9	43.879	84.271	40.392	200.90	+ 0.056	2
						.909	.313	.404	200.96		Images blazing.
						.899	.305	.406	200.97		
						.900	.266	.366	200.77		
						43.901	84.301	.400	200.94		$\tau = 8^h 16^m.7$
	— 0 ^m .2					84.292	43.853	.439	201.13		$\Delta\delta = 201''.013$
						.304	.878	.426	201.07		$\Delta\rho = + 0''.056$
						.333	.887	.446	201.17		$r_1 = \pm 0''.094$
						.332	.872	.460	201.24		
	22	53	1	51.2	55.2	.289	.881	.408	200.98	+ 0.056	
Nov. 4	22	34	1	32.1	41.5	84.311	43.885	40.426	201.07	+ 0.058	2
						.291	.859	.432	201.10		Images blurred.
						.296	.847	.449	201.18		
						.315	.878	.437	201.12		
						84.286	43.848	.438	201.13		$\tau = 7^h 47^m.6$
	— 0 ^m .3					43.861	84.254	.393	200.90		$\Delta\delta = 201''.035$
						.898	.287	.389	200.88		$\Delta\rho = + 0''.058$
						.869	.294	.425	201.06		$r_1 = \pm 0''.073$
						.895	.285	.390	200.89		
	22	57	1	55.1	41.0	.865	.281	.416	201.02	+ 0.058	

Observations of 61^a Cygni and D. M. + 38° 4345—Continued.

Date.	Clock Time and Corr.	Hour Angle.	Temp.	Micr.	Micr.	$\Delta\delta$	$\Delta\delta$	$\Delta\rho$	Wt.	Remarks.
1881. Nov. 5	h. m.	h. m.		r.	r.	r.	"	"		
	— 0 ^m .3	1 48.1	53.5	43.853	84.298	40.445	201.16	+ 0.056	3	
				.844	.296	.452	201.20			
				.869	.297	.428	201.08			
				.840	.292	.452	201.20			
				43.866	84.315	.449	201.18			$\tau = 7^h 57^m.1$
				84.317	43.863	.454	201.21			$\Delta\delta = 201''.137$
				.291	.865	.426	201.07			$\Delta\rho = + 0''.056$
				.298	.849	.449	201.18			$\tau_1 = \pm 0''.048$
				.289	.875	.414	201.01			
		2 6.1	53.0	.291	.863	.428	201.08	+ 0.056		
Nov. 29	22 27	1 24.8	43.8	43.862	84.301	40.439	201.13	+ 0.058	3	Very faint during last set; moisture on objective.
				.863	.291	.428	201.08			
				.848	.301	.453	201.20			
				.888	.289	.401	200.94			
				43.864	84.302	.438	201.13			$\tau = 6^h 2^m.5$
				84.286	43.858	.428	201.08			$\Delta\delta = 201''.087$
				.272	.838	.434	201.11			$\Delta\rho = + 0''.058$
				.313	.891	.422	201.05			$\tau_1 = \pm 0''.054$
				.300	.853	.447	201.17			
	22 51	1 48.8	43.6	.309	.900	.409	200.98	+ 0.058		
Dec. 1	22 33	1 30.8	53.8	43.834	84.287	40.453	201.20	+ 0.056	2	Clouds, and windy.
				.815	.308	.493	201.40			
				.851	.262	.411	200.99			
				.850	.275	.425	201.06			
				43.818	84.311	.493	201.40			$\tau = 6^h 3^m.1$
				84.291	43.818	.473	201.30			$\Delta\delta = 201''.200$
				.281	.839	.442	201.15			$\Delta\rho = + 0''.056$
				.267	.811	.456	201.22			$\tau_1 = \pm 0''.103$
				.282	.872	.410	200.99			
	23 2	1 59.8	53.0	.291	.821	.470	201.29	+ 0.056		
Dec. 4	22 10	1 7.8	46.0	43.844	84.308	40.464	201.26	+ 0.058	3	
				.852	.297	.445	201.16			
				.850	.300	.450	201.19			
				.868	.319	.451	201.19			
				43.871	84.282	.411	200.99			$\tau = 5^h 23^m.4$
				84.280	43.850	.430	201.09			$\Delta\delta = 201''.110$
				.269	.859	.410	200.99			$\Delta\rho = + 0''.058$
				.290	.848	.442	201.15			$\tau_1 = \pm 0''.055$
				.273	.870	.403	200.95			
	22 29	1 26.8	41.1	84.290	43.852	.438	201.13	+ 0.058		
Dec. 5	22 41	1 38.8	42.0	43.842	84.298	40.456	201.22	+ 0.058	3	
				.864	.314	.450	201.19			
				.840	.277	.437	201.12			
				.858	.271	.413	201.00			
				43.845	84.303	.458	201.23			$\tau = 5^h 50^m.4$
				84.280	43.828	.452	201.20			$\Delta\delta = 201''.157$
				.267	.848	.419	201.03			$\Delta\rho = + 0''.058$
				.300	.841	.459	201.23			$\tau_1 = \pm 0''.055$
				.284	.837	.447	201.17			
	23 0	1 57.8	41.5	84.277	43.829	.448	201.18	+ 0.058		
Dec. 7	22 36	1 33.8	41.5	84.302	43.825	40.477	201.32	+ 0.058	2	Very windy.
				.310	.830	.480	201.34			
				.304	.853	.451	201.19			
				.289	.835	.454	201.21			
				84.281	43.825	.456	201.22			$\tau = 5^h 40^m.0$
				43.827	84.318	.491	201.39			$\Delta\delta = 201''.296$
				.814	.296	.482	201.34			$\Delta\rho = + 0''.058$
				.829	.338	.509	201.48			$\tau_1 = \pm 0''.064$
				.836	.302	.466	201.27			
	23 0	1 33.8	41.2	43.828	84.280	.452	201.20	+ 0.058		

From these observations we have for the mean values of the probable errors of a single measurement in the case of α Lyræ,

$$\begin{aligned} \text{Illumination A, } r_1 &= \pm 0''.07365, & 688 \text{ measurements} \\ \text{Illumination B, } r_1 &= \pm 0''.07732, & 590 \text{ measurements} \end{aligned}$$

These values of the probable errors are practically equal, and show that but little has been gained by illuminating the field. Still I am inclined to think that with a good field illumination under proper control, one is less liable to constant errors in any given position of the micrometer. The companion of α Lyræ is too faint for a strongly illuminated field; but, on the other hand, the image of the large star was generally better than I expected to find it, and the bisections could be made in a satisfactory manner. The color of this star seems well suited to our 26-inch objective.

The observations of ϵ Cygni give

$$\text{Illumination A, } r_1 = \pm 0''.08114, \quad 660 \text{ measurements}$$

This probable error is a little greater than for the measurements of α Lyræ, while from the magnitude of the stars one would expect a different result; ϵ Cygni being smaller than α Lyræ and the star D. M. + 38°, 4345, brighter than the companion of α Lyræ. But the color of ϵ Cygni is such that the image of this star is generally not well defined by our glass; and, again, the difference of declination is so great that the stars were too far apart to be observed with the best results.

The observed differences of declination need three more corrections before they are ready to be introduced into the equations of condition for determining the differential annual parallax. These are

- (α) The reductions for nutation, aberration, and for precession to 1881.0;
- (β) The reduction to the same epoch for the proper motion of the principal stars;
- (γ) A reduction for the influence of changes of temperature on the screw of the micrometer.

(α) Since the differences of right ascension and declination are small we may consider them as differentials, and by differentiating the Besselian formula for the reduction of a star to mean place we shall have for the reduction under this head,

$$\begin{aligned} d. \Delta\delta &= \{A n \sin \alpha + B \cos \alpha + C \cos \alpha \sin \delta + D \sin \alpha \sin \delta\} . d\alpha \\ &+ \{C \tan \omega \sin \delta + C \sin \alpha \cos \delta - D \cos \alpha \cos \delta\} . d\delta \end{aligned}$$

or

$$\begin{aligned} d. \Delta\delta &= \{g \sin (G + \alpha) + h \sin (H + \alpha) \sin \delta\} . d\alpha \\ &+ \{i \sin \delta - h \cos (H + \alpha) \cos \delta\} . d\delta \end{aligned}$$

The symbols in these formulæ are those of the American Ephemeris, 1880, p. 258; and the formulæ will give the reduction to the beginning of the year by using the auxiliary quantities of that Ephemeris. As we wish to reduce all the observations to 1881.0, those made in 1880 need the further reduction, on account of precession, given by the term,

$$-n \sin \alpha, d\alpha$$

For α *Lyrae* this term is $+0''.002$; and for δ *Cygni* it is $+0''.0004$. The values used for $d\alpha$ and $d\delta$ are for α *Lyrae*,

$$d\alpha = + \frac{20''.21}{206265}; \quad d\delta = - \frac{44''.24}{206265}$$

and for δ *Cygni*,

$$d\alpha = + \frac{6''.40}{206265}; \quad d\delta = - \frac{198''.40}{206265}$$

The reductions of the differences of declination to 1881.0 are given in the following tables. The dates are for Washington midnight.

α *Lyrae*.

Date.	Red.	Date.	Red.	Date.	Red.
1880, May 20	0.000	1880, Oct. 7	+ 0.002	1881, Feb. 24	- 0.003
30	0.000	17	0.001	Mar. 6	0.003
June 9	+ 0.001	27	0.001	16	0.003
19	0.001	Nov. 6	+ 0.001	26	0.003
29	0.001	16	0.000	April 5	0.003
July 9	0.001	26	0.000	15	0.003
19	0.002	Dec. 6	- 0.001	25	0.003
29	0.002	16	0.001	May 5	0.002
Aug. 8	0.002	26	0.002	15	0.002
18	0.002	1881, Jan. 5	0.002	25	0.002
28	0.002	15	0.003	June 4	0.001
Sept. 7	0.002	25	0.003	14	0.001
17	0.002	Feb. 4	0.003	24	0.001
27	0.002	14	0.003	July 4	- 0.001
Oct. 7	+ 0.002	24	- 0.003	14	0.000

δ *Cygni*.

Date.	Red.	Date.	Red.	Date.	Red.
1880, Oct. 20	+ 0.010	1881, Mar. 9	- 0.004	1881, July 27	- 0.006
30	0.011	19	0.006	Aug. 6	0.004
Nov. 9	0.012	29	0.007	16	- 0.002
19	0.012	April 8	0.009	26	0.000
29	0.012	18	0.010	Sept. 5	+ 0.002
Dec. 9	0.011	28	0.011	15	0.004
19	0.011	May 8	0.012	25	0.006
29	0.010	18	0.012	Oct. 5	0.007
1881, Jan. 8	0.009	28	0.012	15	0.009
18	0.007	June 7	0.012	25	0.010
28	0.005	17	0.011	Nov. 4	0.011
Feb. 7	0.003	27	0.010	14	0.011
17	+ 0.001	July 7	0.009	24	0.012
27	- 0.001	17	0.008	Dec. 4	0.011
Mar. 9	- 0.004	27	- 0.006	14	+ 0.011

(β) For the annual proper motion of α *Lyrae* I adopt the value given by Professor BOSS:

$$\mu = + 0''.2724$$

On account of the orbital motion of 61² *Cygni* I adopt the value of the proper motion which results from BOSS's investigation, combined with O. STRUVE's value of the relative motion in declination. We have, therefore, for 1881.0,

$$\mu = + 3''.2276 - 0''.1838 = + 3''.0438$$

(γ) Our 26-inch refractor was not provided with an apparatus for adjusting the stellar focus, but at first this was done by holding the micrometer with the hands and pushing in or drawing out the tube of the micrometer until the right position was found, when the tube was clamped by an assistant. This method was troublesome, and the observer was tempted to put up with an adjustment that was not quite satisfactory. To assist in this adjustment, and to enable one to find the focus easily after the micrometer had been removed, a scale reading to $\frac{1}{16}$ of an inch was engraved on the tube in 1876. In the spring of 1880, before beginning the observations for parallax, a new arrangement for adjusting the stellar focus was attached to this telescope by Mr. Gardner. This consists of three light brass rings fitting closely on the tube of the micrometer, the middle ring moving in a dovetail between the others. From the middle ring a knob of the metal projects, and through this is passed a screw which works into a fixed part of the telescope. When the tube is unclamped a slight motion can be given to it by means of this screw, and the focus can be adjusted deliberately; and at the same time the zero of the position circle can be changed as one pleases. I have found that the change of the focal adjustment from summer to winter is $\frac{1}{16}$ of an inch, and, contrary to what might be expected, the tube has to be pushed in during cold weather, and drawn out in summer. If this were simply a change of focal distance it would produce a change of $0''.0038$ in the difference of declination of α *Lyrae* and its companion, and a change of $0''.0177$ in the case of 61² *Cygni*. But as the total effect of changes of temperature on the tube of the telescope and the screw and on the objective cannot well be separated, it seemed better to test the effect of changes of temperature on the whole apparatus, at the same time that the observations for parallax were being made; I have therefore measured the difference of declination of the two stars No. 5 and No. 12 of Professor KRUEGER's catalogue of the stars in the cluster *h Persei*. This difference of declination is $18' 38''$; and by means of the stars situated between, one can pass easily from one of these stars to the other, using the same eyepiece that has been used in the observations for parallax. These observations were made in pairs on successive days, the movable wire being placed on different sides of the fixed wire on these days for the purpose of eliminating any error in the coincidence of the wires, although this was observed on each night, and also to render the observations like those made for parallax. I have assumed that these stars have no relative proper motion, which is indicated by the meridian observations, and by my own measurements made after the interval of a year. In the following table are given the results of the observations made on sixteen nights:

Date.	R.	Temp.
1880, Dec. 15-16	9.9013	37.1 F.
18-20	9.9066	30.9
1881, Jan. 14-17	9.9240	27.7
July 19-21	9.9017	69.4
23-24	9.8952	69.3
25-28	9.8970	70.0
Dec. 10-15	9.9067	33.4
16-17	9.9117	34.2

The values of R have been found by bringing forward the positions of KRUEGER'S catalogue, which give for 1880.0.

$$\Delta\delta = 1117''.84$$

The mean value of R differs from the value adopted in the reductions, but my purpose being to find the coefficient of temperature, and not the absolute value of the revolution, I have not endeavored to correct KRUEGER'S $\Delta\delta$ by means of meridian observations. The mean value is

$$R = 9''.9055$$

Subtracting each value from the mean value, the equation of condition for the residuals will be of the form

$$x + (\theta - 50^\circ) y + n = 0$$

x being the correction to the mean value of R , y the temperature coefficient, and θ the reading of the Fahrenheit thermometer. The observations give the following equations of condition :

Equations.	Residuals.
$x - 12.9y + 42 = 0$	+ 0.0087
$x - 19.1y - 11 = 0$	+ 0.0057
$x - 22.3y - 185 = 0$	- 0.0106
$x + 19.4y + 38 = 0$	- 0.0031
$x + 19.3y + 103 = 0$	+ 0.0032
$x + 20.0y + 85 = 0$	+ 0.0012
$x - 16.6y - 12 = 0$	+ 0.0047
$x - 15.8y - 62 = 0$	- 0.0006

Giving to these equations equal weight, we have, by the method of least squares,

$$x = -0''.000101 \pm 0''.001648$$

$$y = -0''.00036054 \pm 0''.00008976$$

Denoting by R_0 the value of a revolution for the temperature 50° F. and by R_θ the value for the temperature θ we have therefore,

$$R_\theta = R_0 - 0''.00036054 (\theta - 50^\circ)$$

These observations were not reduced until January, 1882, and the coefficient for temperature is much greater than I expected to find, since in all our previous reductions it has been assumed that this coefficient is zero. According to my plan of observing the determination of this coefficient was to be made while the observations for parallax were going on, and I think that I must accept this result, although unexpected. At the same time I regret that more observations were not made for the determination of this coefficient. Indeed it was my intention to make a set during the warm weather in the early part of September, 1881, but by some oversight they were omitted, and perhaps the assurance that this coefficient was zero made me too negligent. It is not probable that this coefficient has been produced by a change of declination of one of the stars, caused by its annual parallax, since the observations were made at a time when the coefficient of parallax in declination was small. As the coefficient of temperature needs further investigation, and as the stars No. 5 and No. 12, of KRUEGER'S catalogue are convenient for this purpose, I give the formula which I have computed for the reduction of the difference of declination. This difference is assumed to be positive, and the formula gives the correction to be added to the difference of the mean declinations to get the apparent difference. The notation is that of BESSEL, which has been used in the American Ephemeris since 1864.

1880.	$\Delta\delta = A. (8.8513_n) + B. (7.7416_n) + C. (7.9127_n) + D. (6.6467_n)$
1885.	$\Delta\delta = A. (8.8525_n) + B. (7.7417_n) + C. (7.9130_n) + D. (6.6635_n)$
1890.	$\Delta\delta = A. (8.8543_n) + B. (7.7418_n) + C. (7.9132_n) + D. (6.6797_n)$
1895.	$\Delta\delta = A. (8.8555_n) + B. (7.7420_n) + C. (7.9134_n) + D. (6.6938_n)$
1900.	$\Delta\delta = A. (8.8567_n) + B. (7.7421_n) + C. (7.9137_n) + D. (6.7061_n)$
1905.	$\Delta\delta = A. (8.8585_n) + B. (7.7423_n) + C. (7.9140_n) + D. (6.7220_n)$
1910.	$\Delta\delta = A. (8.8603_n) + B. (7.7425_n) + C. (7.9143_n) + D. (6.7360_n)$

The quantities in parentheses are logarithms, and the letter n after the logarithms denotes that the factor is negative.

The following tables give the observed differences of declination corrected for refraction; the reduction of this apparent difference to 1880; then $\Delta\mu$ the reduction for proper motion to the same epoch; the reduction to the temperature of 50° F.; the sum of the reductions denoted by Σ , and finally the mean values of $\Delta\delta$. The reductions have been given separately, so that if any change in the temperature coefficient of the micrometer screw is indicated by future observations the proper correction may be made easily.

α Lyræ. Illumination A.

Date.	λ	$d\delta$	$\Delta\mu$	$\Delta\theta$	$\Delta\theta_0$	$\Delta\delta_0$
1880.						
May 24	44.134	0.000	+ 0.164	+ 0.037	+ 0.201	44.335
25	44.211	0.000	0.163	0.043	0.206	44.417
26	44.197	0.000	0.163	0.044	0.207	44.404
27	44.180	0.000	0.162	0.038	0.200	44.380
31	44.214	0.000	0.159	0.034	0.193	44.407
June 2	44.174	0.000	0.157	0.008	0.165	44.339
17	44.072	+ 0.001	0.146	0.030	0.177	44.249
18	44.128	0.001	0.145	0.033	0.179	44.337
21	44.176	0.001	0.143	0.043	0.187	44.363
22	44.183	0.001	0.142	0.042	0.185	44.368
23	44.215	0.001	0.142	0.046	0.189	44.404
27	44.201	0.001	0.139	0.050	0.190	44.391
28	44.144	0.001	0.138	0.049	0.188	44.332
30	44.220	0.001	0.137	0.042	0.180	44.400
July 3	44.156	0.001	0.134	0.034	0.169	44.325
27	44.112	0.002	0.116	0.042	0.160	44.272
28	44.144	0.002	0.116	0.037	0.155	44.299
30	44.148	0.002	0.114	0.039	0.155	44.303
31	44.189	0.002	0.113	0.045	0.160	44.349
Aug. 12	44.118	0.002	0.105	0.042	0.149	44.267
15	44.195	0.002	0.102	0.034	0.138	44.333
16	44.210	0.002	0.102	0.037	0.141	44.351
Sept. 14	44.258	0.002	0.080	0.015	0.097	44.355
15	44.245	0.002	0.079	0.018	0.099	44.344
17	44.224	0.002	0.078	0.038	0.118	44.342
18	44.274	0.002	0.077	0.045	0.124	44.398
22	44.261	0.002	0.074	0.026	0.102	44.363
Oct. 20	44.149	0.001	0.053	+ 0.010	0.064	44.213
24	44.213	0.001	0.050	- 0.006	0.045	44.258
25	44.174	0.001	0.049	- 0.001	0.049	44.223
31	44.226	0.001	0.045	+ 0.003	0.049	44.275
Nov. 1	44.139	0.001	0.044	0.002	0.047	44.186
2	44.160	+ 0.001	0.043	+ 0.008	+ 0.052	44.212
Dec. 3	44.117	- 0.001	0.020	- 0.020	- 0.001	44.116
7	44.148	0.001	0.017	0.044	0.028	44.120
9	44.140	0.001	0.016	0.042	0.027	44.113
11	44.152	0.001	0.014	0.034	0.021	44.131
13	44.021	0.001	0.013	0.015	0.003	44.018
15	44.038	0.001	0.011	0.014	0.004	44.034
16	44.056	0.001	0.011	0.017	0.007	44.049
18	44.068	0.001	+ 0.009	0.024	0.016	44.052
1881.						
Feb. 10	44.321	0.003	- 0.032	0.026	0.061	44.260
13	44.273	0.003	0.034	0.038	0.075	44.198
14	44.182	0.003	0.035	0.045	0.083	44.099
17	44.254	0.003	0.036	0.041	0.080	44.174
19	44.311	0.003	0.038	0.036	0.077	44.234
21	44.304	- 0.003	- 0.040	- 0.034	- 0.077	44.227

α Lyræ. Illumination A—Continued.

Date.	$\Delta \delta$	$d\delta$	$\Delta \mu$	$\Delta \theta$	Σ	$\Delta \delta_0$
1881.	"	"	"	"	"	"
Mar. 14	44.207	— 0.003	— 0.055	— 0.027	— 0.085	44.122
15	44.338	0.003	0.056	0.018	0.077	44.261
21	44.349	0.003	0.061	0.025	0.089	44.260
23	44.313	0.003	0.062	0.028	0.093	44.220
26	44.340	0.003	0.064	0.030	0.097	44.243
27	44.427	0.003	0.065	— 0.028	0.096	44.331
27	44.326	0.003	0.088	+ 0.009	0.082	44.244
29	44.523	0.003	0.090	+ 0.002	0.091	44.432
30	44.485	0.003	0.090	— 0.004	0.097	44.388
May 6	44.454	0.002	0.095	+ 0.010	0.087	44.367
7	44.493	0.002	0.096	0.010	0.088	44.405
8	44.460	0.002	0.096	0.015	0.083	44.377
25	44.446	0.002	0.109	0.022	0.089	44.357
26	44.452	0.002	0.110	0.020	0.092	44.360
27	44.478	0.002	0.110	0.027	0.085	44.393
28	44.549	0.002	0.111	0.032	0.081	44.468
30	44.443	0.002	0.113	0.037	0.078	44.365
June 22	44.584	0.001	0.130	0.021	0.110	44.474
26	44.503	0.001	0.133	0.039	0.095	44.408
28	44.484	0.001	0.134	0.048	0.087	44.397
July 1	44.477	0.001	0.136	0.032	0.105	44.372
2	44.512	— 0.001	— 0.137	+ 0.034	— 0.104	44.408

 α Lyræ. Illumination B.

1880.						
May 27	44.255	0.000	+ 0.162	+ 0.040	+ 0.202	44.457
31	44.225	0.000	0.159	0.035	0.194	44.419
June 2	44.346	0.000	0.157	0.009	0.166	44.512
22	44.202	+ 0.001	0.142	0.043	0.186	44.388
23	44.290	0.001	0.142	0.048	0.191	44.481
24	44.273	0.001	0.141	0.052	0.194	44.467
26	44.424	0.001	0.140	0.042	0.183	44.607
28	44.241	0.001	0.138	0.049	0.188	44.429
30	44.349	0.001	0.137	0.041	0.179	44.528
July 3	44.254	0.001	0.134	0.036	0.171	44.425
26	44.192	0.002	0.117	0.052	0.171	44.363
28	44.236	0.002	0.116	0.039	0.157	44.393
29	44.338	0.002	0.115	0.039	0.156	44.494
Aug. 12	44.285	0.002	0.105	0.035	0.142	44.427
16	44.200	0.002	0.102	— 0.036	0.140	44.340
Sept. 15	44.197	0.002	0.079	0.016	0.097	44.294
16	44.177	0.002	0.078	0.024	0.104	44.281
17	44.148	0.002	0.078	0.036	0.116	44.264
18	44.353	0.002	0.077	0.043	0.122	44.475
22	44.229	0.002	0.074	0.025	0.101	44.330
Oct. 20	44.242	+ 0.001	+ 0.053	+ 0.008	+ 0.062	44.304

α Lyræ. Illumination B—Continued.

Date.	$\Delta \delta$	$d\delta$	$\Delta \mu$	$\Delta \theta$	Σ	$\Delta \delta_0$
1880.	"	"	"	"	"	"
Oct. 24	44.196	+ 0.001	+ 0.050	— 0.007	+ 0.044	44.240
25	44.229	0.001	0.049	— 0.002	0.048	44.277
31	44.179	0.001	0.045	+ 0.002	0.048	44.227
Nov. 1	44.134	+ 0.001	0.044	+ 0.001	+ 0.046	44.180
Dec. 3	44.129	— 0.001	0.020	— 0.021	— 0.002	44.127
9	44.065	0.001	0.016	0.043	0.028	44.037
11	44.053	0.001	0.014	0.035	0.022	44.031
13	44.137	0.001	0.013	0.016	0.004	44.133
16	44.154	0.001	0.011	0.018	0.008	44.146
18	44.034	0.001	0.009	0.025	0.017	44.017
22	44.071	0.002	+ 0.006	0.029	0.025	44.046
1881.						
Feb. 6	44.357	0.003	— 0.029	0.067	0.099	44.258
12	44.398	0.003	0.033	0.031	0.067	44.331
14	44.264	0.003	0.035	0.044	0.082	44.182
16	44.300	0.003	0.036	0.041	0.080	44.220
19	44.309	0.003	0.038	0.036	0.077	44.232
21	44.303	0.003	0.040	0.034	0.077	44.226
Mar. 14	44.401	0.003	0.055	0.026	0.084	44.317
15	44.374	0.003	0.056	0.018	0.077	44.297
21	44.456	0.003	0.061	0.026	0.090	44.366
23	44.355	0.003	0.062	0.027	0.092	44.263
26	44.476	0.003	0.064	0.030	0.097	44.379
27	44.399	0.003	0.065	— 0.028	0.096	44.303
Apr. 27	44.510	0.003	0.088	+ 0.009	0.082	44.428
29	44.539	0.003	0.090	+ 0.004	0.089	44.450
30	44.532	0.003	0.090	— 0.002	0.095	44.437
May 7	44.476	0.002	0.096	+ 0.009	0.089	44.387
8	44.521	0.002	0.096	0.014	0.084	44.437
25	44.518	0.002	0.109	0.023	0.088	44.430
26	44.542	0.002	0.110	0.021	0.091	44.451
27	44.610	0.002	0.110	0.026	0.086	44.524
28	44.548	0.002	0.111	0.032	0.081	44.467
30	44.590	0.002	0.113	0.037	0.078	44.512
June 22	44.586	0.001	0.130	0.022	0.109	44.477
26	44.651	0.001	0.133	0.040	0.094	44.557
28	44.615	0.001	0.134	0.050	0.085	44.530
July 1	44.663	0.001	0.136	0.030	0.107	44.556
2	44.572	— 0.001	— 0.137	+ 0.033	— 0.105	44.467

61² Cygni.

Date.	$\Delta \delta$	$d\delta$	$\Delta \mu$	$\Delta \theta$	Σ	$\Delta \delta$
1880.	"	"	"	"	"	"
Oct. 24	198.200	+ 0.010	+ 0.560	- 0.057	+ 0.513	198.713
25	197.928	0.010	0.552	0.029	0.533	198.461
31	198.018	0.011	0.502	0.007	0.506	198.524
Nov. 1	198.007	0.011	0.493	- 0.014	0.490	198.497
2	198.071	0.011	0.485	+ 0.006	0.502	198.573
Dec. 3	198.102	0.012	0.227	- 0.102	0.137	198.239
7	198.166	0.011	0.194	0.204	+ 0.001	198.167
9	198.181	0.011	0.177	0.199	- 0.011	198.170
11	198.191	0.011	0.161	0.161	+ 0.011	198.202
13	198.174	0.011	0.144	0.078	0.077	198.251
15	198.186	0.011	+ 0.127	0.068	+ 0.070	198.256
1881.						
Jan. 12	198.396	0.008	- 0.106	0.157	- 0.255	198.141
14	198.487	0.008	0.123	0.173	0.288	198.199
17	198.465	0.007	0.148	0.114	0.255	198.210
19	198.458	0.007	0.165	0.140	0.298	198.160
22	198.516	0.006	0.190	0.105	0.289	198.227
26	198.454	0.005	0.223	0.114	0.332	198.122
28	198.522	+ 0.005	0.240	0.174	0.409	198.113
Mar. 14	198.898	- 0.005	0.618	0.126	0.749	198.149
15	199.167	0.005	0.627	0.087	0.719	198.448
21	199.045	0.006	0.677	0.115	0.798	198.247
23	199.321	0.006	0.694	0.127	0.827	198.494
26	198.971	0.007	0.719	0.138	0.864	198.107
27	199.237	0.007	0.727	- 0.125	0.859	198.378
Apr. 27	199.430	0.011	0.985	+ 0.039	0.957	198.473
29	199.392	0.011	1.001	+ 0.004	1.008	198.384
30	199.524	0.011	1.010	- 0.023	1.044	198.480
May 6	199.611	0.012	1.060	+ 0.039	1.033	198.578
7	199.685	0.012	1.068	0.036	1.044	198.641
8	199.548	0.012	1.076	0.058	1.030	198.518
25	199.795	0.012	1.217	0.092	1.137	198.658
26	200.011	0.012	1.225	0.087	1.150	198.861
27	199.853	0.012	1.234	0.111	1.135	198.718
28	199.911	0.012	1.242	0.142	1.112	198.799
30	200.014	0.012	1.259	0.166	1.105	198.909
June 26	200.187	0.010	1.484	0.159	1.335	198.852
28	200.285	0.010	1.500	0.208	1.302	198.983
July 1	200.314	0.010	1.525	0.123	1.412	198.902
2	200.264	0.009	1.533	0.135	1.407	198.857
19	200.649	0.008	1.676	0.133	1.551	199.098
21	200.440	0.007	1.692	0.159	1.540	198.900
23	200.427	0.007	1.709	0.136	1.580	198.847
24	200.504	0.006	1.717	0.152	1.571	198.933
25	200.519	0.006	1.725	0.180	1.551	198.968
28	200.584	- 0.006	- 1.751	+ 0.115	- 1.642	198.942

61² Cygni—Continued.

Date.	$\Delta\delta$	δ	$\Delta\mu$	$\Delta\theta$	Σ	$\Delta\delta$
1881.	"	"	"	"	"	"
Aug. 22	200.776	— 0.001	— 1.958	+ 0.154	— 1.805	198.971
23	200.774	— 0.001	1.966	0.164	1.803	198.971
24	200.741	0.000	1.974	0.179	1.795	198.946
25	200.745	0.000	1.982	0.171	1.811	198.934
26	200.761	0.000	1.991	0.162	1.829	198.932
Sept. 5	200.788	+ 0.002	2.075	0.248	1.825	198.963
6	200.765	0.002	2.082	0.227	1.853	198.912
24	200.841	0.006	2.232	0.220	2.006	198.835
26	200.934	0.006	2.248	0.247	1.995	198.939
27	200.879	0.006	2.258	0.216	2.036	198.843
29	200.937	0.006	2.274	0.206	2.062	198.875
Oct. 22	200.998	0.010	2.465	0.058	2.397	198.601
26	201.052	0.010	2.499	0.022	2.467	198.585
27	201.069	0.010	2.507	+ 0.040	2.457	198.612
Nov. 4	201.093	0.011	2.573	— 0.063	2.625	198.468
5	201.193	0.011	2.582	+ 0.023	2.548	198.645
29	201.145	0.012	2.781	— 0.045	2.814	198.331
Dec. 1	201.256	0.011	2.798	+ 0.025	2.762	198.496
4	201.168	0.011	2.822	— 0.035	2.846	198.322
5	201.215	0.011	2.831	0.060	2.880	198.335
7	201.354	+ 0.011	— 2.854	— 0.062	— 2.905	198.449

In the case of α Lyræ the reduced values of $\Delta\delta$ show that the adopted annual proper motion of this star represents the measurements very well. On the other hand, the observations of 61² Cygni indicate a small correction to the value of this proper motion, but this will be cared for by the equations of condition. These equations are of the form,

$$x + by + cz + du + n = 0$$

In this equation x is the correction to an assumed value of $\Delta\delta$; y is the correction to the value of the annual proper motion which has been used in reducing the $\Delta\delta$ of the two stars to the epoch 1881.0; z is the difference of the constants of aberration, which have been assumed to be the same for both stars; and u is the annual relative parallax of the stars. The coefficients have the following values:

$$b = 1881.0 - \tau$$

$$\begin{aligned} c &= (9.94578) \sin (\odot + 264 \ 11.1); & \alpha \text{ Lyræ} \\ c &= (9.92225) \sin (\odot + 238 \ 15.2); & 61^2 \text{ Cygni} \\ d &= (9.94578) R \cos (\odot + 264 \ 11.1); & \alpha \text{ Lyræ} \\ d &= (9.92225) R \cos (\odot + 238 \ 15.2); & 61^2 \text{ Cygni} \end{aligned}$$

where \odot is the longitude of the sun, and R its radius vector. The independent term n is the difference between an assumed value of $\Delta\delta$ and the observed value. These values have been assumed as follows:

$$\begin{aligned} &\text{for } \alpha \text{ Lyræ}; \quad \Delta\delta_0 = 44''.200 \text{ and } \Delta\delta_0 = 44''.300 \\ &\text{for } 61^2 \text{ Cygni}; \quad \Delta\delta_0 = 198''.560 \end{aligned}$$

In nearly every case the weight unity has been assigned to the observation, but for a few nights, where the notes indicate unusual disturbance of the images, the weight has been reduced to one-half. The following are the equations of condition:

α Lyræ. Illumination A.

No.	Date.	Equations.				Residuals.	Wt.
	1880.						
1	May 24	$x + 0.6023y - 0.4608z + 0.7628u - 0.135 = 0$				+ 0.005	1
2	25	+ 0.5996 - 0.4481 + 0.7707 - 0.217				- 0.075	.
3	26	+ 0.5969 - 0.4354 + 0.7783 - 0.204				- 0.060	.
4	27	+ 0.5941 - 0.4225 + 0.7857 - 0.180				- 0.035	.
5	31	+ 0.5832 - 0.3703 + 0.8128 - 0.207				- 0.056	.
6	June 2	+ 0.5777 - 0.3430 + 0.8253 - 0.136				+ 0.014	.
7	17	+ 0.5367 - 0.1316 + 0.8870 - 0.049				+ 0.120	.
8	18	+ 0.5340 - 0.1170 + 0.8891 - 0.137				+ 0.032	.
9	21	+ 0.5258 - 0.0733 + 0.8941 - 0.163				+ 0.008	.
10	22	+ 0.5230 - 0.0583 + 0.8953 - 0.168				+ 0.004	.
11	23	+ 0.5204 - 0.0441 + 0.8961 - 0.204				- 0.031	.
12	27	+ 0.5096 + 0.0135 + 0.8973 - 0.191				- 0.017	.
13	28	+ 0.5068 + 0.0288 + 0.8969 - 0.132				+ 0.043	.
14	30	+ 0.5012 + 0.0582 + 0.8955 - 0.200				- 0.025	.
15	July 3	+ 0.4930 + 0.1024 + 0.8914 - 0.125				+ 0.051	.
16	27	+ 0.4275 + 0.4346 + 0.7799 - 0.072				+ 0.095	.
17	28	+ 0.4248 + 0.4473 + 0.7724 - 0.099				+ 0.067	.
18	30	+ 0.4193 + 0.4723 + 0.7567 - 0.103				+ 0.062	.
19	31	+ 0.4166 + 0.4849 + 0.7484 - 0.149				+ 0.015	.
20	Aug. 12	+ 0.3838 + 0.6220 + 0.6343 - 0.067				+ 0.083	.
21	15	+ 0.3755 + 0.6530 + 0.6010 - 0.133				+ 0.013	.
22	16	+ 0.3729 + 0.6623 + 0.5904 - 0.151				- 0.007	.
23	Sept. 14	+ 0.2934 + 0.8592 + 0.2032 - 0.155				- 0.063	.
24	15	+ 0.2906 + 0.8625 + 0.1885 - 0.144				- 0.055	.
25	17	+ 0.2851 + 0.8684 + 0.1586 - 0.142				- 0.057	.
26	18	+ 0.2825 + 0.8708 + 0.1444 - 0.198				- 0.115	.
27	22	+ 0.2715 + 0.8786 + 0.0842 - 0.163				- 0.089	.
28	Oct. 20	+ 0.1951 + 0.8176 - 0.3308 - 0.013				0.000	.
29	24	+ 0.1841 + 0.7926 - 0.3860 - 0.058				- 0.054	.
30	25	+ 0.1814 + 0.7856 - 0.3996 - 0.023				- 0.021	.
31	31	+ 0.1650 + 0.7394 - 0.4782 - 0.075				- 0.085	.
32	Nov. 1	+ 0.1622 + 0.7308 - 0.4909 + 0.014				+ 0.002	.
33	2	+ 0.1595 + 0.7219 - 0.5034 - 0.012				- 0.028	.
34	Dec. 3	+ 0.0747 + 0.3536 - 0.7968 + 0.084				+ 0.022	.
35	7	+ 0.0638 + 0.2954 - 0.8191 + 0.080				+ 0.014	.
36	9	+ 0.0583 + 0.2656 - 0.8286 + 0.087				+ 0.019	.
37	11	+ 0.0528 + 0.2356 - 0.8372 + 0.069				0.000	.
38	13	+ 0.0474 + 0.2052 - 0.8448 + 0.182				+ 0.111	.
39	15	+ 0.0419 + 0.1746 - 0.8513 + 0.166				+ 0.094	.
40	16	+ 0.0391 + 0.1592 - 0.8541 + 0.151				+ 0.078	.
41	18	+ 0.0337 + 0.1283 - 0.8590 + 0.148				+ 0.074	.
	1881.						
42	Feb. 10	- 0.1157 - 0.6468 - 0.5930 - 0.060				- 0.099	.
43	13	- 0.1239 - 0.6776 - 0.5588 + 0.002				- 0.031	.

α Lyræ. Illumination A—Continued.

No.	Date.	Equations.	Residuals.	Wt.
	1881.			
44	Feb. 14	$x - 0.1267y - 0.6875z - 0.5469u + 0.101 = 0$	+ 0.069	1
45	16	$- 0.1321 - 0.7065 - 0.5231 + 0.026$	- 0.003	.
46	19	$- 0.1403 - 0.7333 - 0.4860 - 0.034$	- 0.056	.
47	21	$- 0.1457 - 0.7501 - 0.4605 - 0.027$	- 0.045	.
48	Mar. 14	$- 0.2031 - 0.8669 - 0.1651 + 0.078$	+ 0.106	.
49	15	$- 0.2059 - 0.8696 - 0.1503 - 0.061$	- 0.030	.
50	21	$- 0.2223 - 0.8806 - 0.0599 - 0.060$	- 0.015	.
51	23	$- 0.2278 - 0.8821 - 0.0294 - 0.020$	+ 0.028	.
52	26	$- 0.2360 - 0.8825 + 0.0163 - 0.043$	+ 0.015	.
53	27	$- 0.2387 - 0.8821 + 0.0314 - 0.131$	- 0.071	.
54	Apr. 27	$- 0.3236 - 0.7454 + 0.4763 - 0.044$	+ 0.092	.
55	29	$- 0.3290 - 0.7291 + 0.5014 - 0.232$	- 0.091	.
56	30	$- 0.3317 - 0.7205 + 0.5141 - 0.188$	- 0.045	.
57	May 6	$- 0.3481 - 0.6654 + 0.5855 - 0.167$	- 0.011	.
58	7	$- 0.3507 - 0.6560 + 0.5964 - 0.205$	- 0.047	.
59	8	$- 0.3534 - 0.6015 + 0.6525 - 0.177$	- 0.009	.
60	25	$- 0.3998 - 0.4511 + 0.7689 - 0.157$	+ 0.034	.
61	26	$- 0.4026 - 0.4384 + 0.7765 - 0.160$	+ 0.032	.
62	27	$- 0.4052 - 0.4257 + 0.7839 - 0.193$	+ 0.001	.
63	28	$- 0.4080 - 0.4127 + 0.7911 - 0.268$	- 0.073	.
64	30	$- 0.4135 - 0.3862 + 0.8050 - 0.165$	+ 0.033	.
65	June 22	$- 0.4763 - 0.0620 + 0.8950 - 0.274$	- 0.053	.
66	26	$- 0.4872 - 0.0039 + 0.8974 - 0.208$	+ 0.015	.
67	28	$- 0.4926 + 0.0258 + 0.8970 - 0.197$	+ 0.027	.
68	July 1	$- 0.5008 + 0.0693 + 0.8947 - 0.172$	+ 0.052	.
69	2	$- 0.5036 + 0.0840 + 0.8933 - 0.208$	+ 0.016	.

 α Lyræ. Illumination B.

	1880.			
1	May 27	$x + 0.5942y - 0.4229z + 0.7854u - 0.157 = 0$	- 0.006	1
2	31	$+ 0.5833 - 0.3704 + 0.8127 - 0.119$	+ 0.038	.
3	June 2	$+ 0.5778 - 0.3434 + 0.8251 - 0.212$	- 0.053	.
4	22	$+ 0.5230 - 0.0586 + 0.8953 - 0.088$	+ 0.091	.
5	23	$+ 0.5204 - 0.0443 + 0.8961 - 0.181$	- 0.008	.
6	24	$+ 0.5177 - 0.0294 + 0.8968 - 0.167$	+ 0.006	.
7	26	$+ 0.5122 - 0.0004 + 0.8974 - 0.307$	- 0.134	.
8	28	$+ 0.5067 + 0.0291 + 0.8969 - 0.129$	+ 0.044	.
9	30	$+ 0.5012 + 0.0586 + 0.8955 - 0.228$	- 0.056	.
10	July 3	$+ 0.4931 + 0.1021 + 0.8915 - 0.125$	+ 0.046	.
11	26	$+ 0.4303 + 0.4214 + 0.7874 - 0.063$	+ 0.086	.
12	28	$+ 0.4248 + 0.4171 + 0.7725 - 0.093$	+ 0.052	.
13	29	$+ 0.4220 + 0.4599 + 0.7646 - 0.194$	- 0.050	.
14	Aug. 12	$+ 0.3838 + 0.6230 + 0.6333 - 0.127$	- 0.011	.
15	16	$+ 0.3729 + 0.6625 + 0.5902 - 0.040$	- 0.067	.
16	Sept. 15	$+ 0.2906 + 0.8625 + 0.1882 + 0.006$	+ 0.030	.
17	16	$+ 0.2879 + 0.8656 + 0.1733 + 0.019$	+ 0.040	.

α Lyræ. Illumination B—Continued.

No.	Date.	Equations.				Residuals.	Wt.
	1880.				"	"	
18	Sept. 17	$x + 0.2850y$	$+ 0.8685z$	$+ 0.1581u$	$+ 0.036 = 0$	$+ 0.038$	$\frac{1}{2}$
19	18	$+ 0.2825$	$+ 0.8709$	$+ 0.1441$	$- 0.175$	$- 0.160$	.
20	22	$+ 0.2715$	$+ 0.8787$	$+ 0.0839$	$- 0.030$	$- 0.027$	.
21	Oct. 20	$+ 0.1950$	$+ 0.8175$	$- 0.3311$	$- 0.004$	$- 0.084$	.
22	24	$+ 0.1841$	$+ 0.7924$	$- 0.3863$	$+ 0.060$	$- 0.030$	.
23	25	$+ 0.1814$	$+ 0.7855$	$- 0.3998$	$+ 0.023$	$- 0.070$	.
24	31	$+ 0.1650$	$+ 0.7392$	$- 0.4784$	$+ 0.073$	$- 0.035$	.
25	Nov. 1	$+ 0.1622$	$+ 0.7307$	$- 0.4910$	$+ 0.120$	$+ 0.009$	.
26	Dec. 3	$+ 0.0747$	$+ 0.3534$	$- 0.7969$	$+ 0.173$	$+ 0.006$	.
27	9	$+ 0.0582$	$+ 0.2654$	$- 0.8287$	$+ 0.263$	$+ 0.091$	.
28	11	$+ 0.0528$	$+ 0.2355$	$- 0.8373$	$+ 0.269$	$+ 0.096$	.
29	13	$+ 0.0473$	$+ 0.2051$	$- 0.8448$	$+ 0.167$	$- 0.007$	.
30	16	$+ 0.0390$	$+ 0.1590$	$- 0.8541$	$+ 0.154$	$- 0.021$	.
31	18	$+ 0.0336$	$+ 0.1280$	$- 0.8590$	$+ 0.283$	$+ 0.107$	.
32	22	$+ 0.0227$	$+ 0.0659$	$- 0.8656$	$+ 0.254$	$+ 0.078$	.
	1881.						
33	Feb. 6	$- 0.1047$	$- 0.6029$	$- 0.6361$	$+ 0.042$	$- 0.052$	$\frac{1}{2}$
34	12	$- 0.1212$	$- 0.6675$	$- 0.5704$	$- 0.031$	$- 0.132$	.
35	14	$- 0.1267$	$- 0.6873$	$- 0.5472$	$+ 0.118$	$+ 0.022$	.
36	16	$- 0.1320$	$- 0.7063$	$- 0.5233$	$+ 0.080$	$- 0.010$	.
37	19	$- 0.1402$	$- 0.7331$	$- 0.4862$	$+ 0.068$	$- 0.014$	.
38	21	$- 0.1457$	$- 0.7496$	$- 0.4611$	$+ 0.074$	$- 0.003$	.
39	Mar. 14	$- 0.2031$	$- 0.8668$	$- 0.1654$	$- 0.017$	$- 0.029$	.
40	15	$- 0.2059$	$- 0.8696$	$- 0.1505$	$+ 0.003$	$- 0.005$	.
41	21	$- 0.2222$	$- 0.8806$	$- 0.0602$	$- 0.066$	$- 0.055$	.
42	23	$- 0.2278$	$- 0.8821$	$- 0.0296$	$+ 0.037$	$+ 0.055$	.
43	26	$- 0.2360$	$- 0.8825$	$+ 0.0160$	$- 0.079$	$- 0.051$	.
44	27	$- 0.2386$	$- 0.8821$	$+ 0.0311$	$- 0.003$	$+ 0.028$	.
45	April 27	$- 0.3235$	$- 0.7455$	$+ 0.4760$	$- 0.128$	$- 0.003$	.
46	29	$- 0.3289$	$- 0.7295$	$+ 0.5009$	$- 0.150$	$- 0.020$	.
47	30	$- 0.3317$	$- 0.7206$	$+ 0.5139$	$- 0.137$	$- 0.004$	.
48	May 7	$- 0.3508$	$- 0.6558$	$+ 0.5966$	$- 0.087$	$+ 0.063$	.
49	8	$- 0.3535$	$- 0.6456$	$+ 0.6077$	$- 0.137$	$+ 0.015$	.
50	25	$- 0.3997$	$- 0.4514$	$+ 0.7687$	$- 0.130$	$+ 0.055$	.
51	26	$- 0.4025$	$- 0.4386$	$+ 0.7764$	$- 0.151$	$+ 0.036$	.
52	27	$- 0.4053$	$- 0.4254$	$+ 0.7841$	$- 0.224$	$- 0.035$	.
53	28	$- 0.4081$	$- 0.4125$	$+ 0.7912$	$- 0.167$	$+ 0.023$	.
54	30	$- 0.4134$	$- 0.3864$	$+ 0.8049$	$- 0.212$	$- 0.019$	.
55	June 22	$- 0.4763$	$- 0.0623$	$+ 0.8950$	$- 0.177$	$+ 0.033$	.
56	26	$- 0.4871$	$- 0.0048$	$+ 0.8973$	$- 0.257$	$- 0.046$	.
57	28	$- 0.4926$	$+ 0.0255$	$+ 0.8970$	$- 0.230$	$- 0.020$	.
58	July 1	$- 0.5008$	$+ 0.0697$	$+ 0.8946$	$- 0.256$	$- 0.046$	.
59	2	$- 0.5036$	$+ 0.0842$	$+ 0.8933$	$- 0.167$	$+ 0.042$	.

61² Cygni.

No.	Date.	Equations.				Residuals.	Wt.
	1880.						
1	Oct. 24	$x + 0.1839y$	$+ 0.8361z$	$- 0.0040w$	$- 0.153 = 0$	$- 0.149$	1
2	25	$+ 0.1812$	$+ 0.8359$	$- 0.0181$	$+ 0.099$	$+ 0.097$	.
3	31	$+ 0.1648$	$+ 0.8294$	$- 0.1045$	$+ 0.036$	$- 0.007$	.
4	Nov. 1	$+ 0.1621$	$+ 0.8274$	$- 0.1189$	$+ 0.063$	$+ 0.013$	.
5	2	$+ 0.1593$	$+ 0.8252$	$- 0.1333$	$- 0.013$	$- 0.069$	.
6	Dec. 3	$+ 0.0746$	$+ 0.6359$	$- 0.5349$	$+ 0.321$	$+ 0.064$	.
7	7	$+ 0.0638$	$+ 0.5960$	$- 0.5774$	$+ 0.393$	$+ 0.114$	.
8	9	$+ 0.0582$	$+ 0.5746$	$- 0.5980$	$+ 0.390$	$+ 0.099$	.
9	11	$+ 0.0528$	$+ 0.5530$	$- 0.6172$	$+ 0.358$	$+ 0.057$	.
10	13	$+ 0.0473$	$+ 0.5300$	$- 0.6363$	$+ 0.309$	$- 0.003$	.
11	15	$+ 0.0418$	$+ 0.5069$	$- 0.6542$	$+ 0.304$	$- 0.017$	.
	1881.						
12	Jan. 12	$- 0.0349$	$+ 0.1275$	$- 0.8127$	$+ 0.419$	$- 0.003$	.
13	14	$- 0.0404$	$+ 0.0981$	$- 0.8168$	$+ 0.361$	$- 0.046$	$\frac{1}{2}$
14	17	$- 0.0486$	$+ 0.0539$	$- 0.8209$	$+ 0.350$	$- 0.081$	.
15	19	$- 0.0542$	$+ 0.0237$	$- 0.8225$	$+ 0.390$	$- 0.031$	$\frac{1}{2}$
16	22	$- 0.0623$	$- 0.0204$	$- 0.8229$	$+ 0.333$	$- 0.104$	.
17	26	$- 0.0732$	$- 0.0796$	$- 0.8197$	$+ 0.438$	$- 0.002$	.
18	28	$- 0.0787$	$- 0.1090$	$- 0.8167$	$+ 0.447$	$+ 0.002$	.
19	Mar. 14	$- 0.2032$	$- 0.6700$	$- 0.4977$	$+ 0.411$	$+ 0.088$	.
20	15	$- 0.2060$	$- 0.6785$	$- 0.4863$	$+ 0.112$	$- 0.146$	$\frac{1}{2}$
21	21	$- 0.2224$	$- 0.7255$	$- 0.4143$	$+ 0.313$	$+ 0.027$	.
22	23	$- 0.2279$	$- 0.7394$	$- 0.3893$	$+ 0.066$	$- 0.209$	.
23	26	$- 0.2361$	$- 0.7586$	$- 0.3509$	$+ 0.453$	$+ 0.195$	.
24	27	$- 0.2388$	$- 0.7646$	$- 0.3379$	$+ 0.182$	$- 0.070$	.
25	April 27	$- 0.3236$	$- 0.8308$	$+ 0.0949$	$+ 0.087$	$+ 0.043$	.
26	29	$- 0.3290$	$- 0.8271$	$+ 0.1229$	$+ 0.176$	$+ 0.151$	.
27	30	$- 0.3318$	$- 0.8249$	$+ 0.1373$	$+ 0.070$	$+ 0.048$	.
28	May 6	$- 0.3481$	$- 0.8070$	$+ 0.2208$	$- 0.018$	$+ 0.003$	.
29	7	$- 0.3509$	$- 0.8033$	$+ 0.2342$	$- 0.081$	$- 0.053$	.
30	8	$- 0.3535$	$- 0.7993$	$+ 0.2478$	$+ 0.042$	$+ 0.077$	.
31	25	$- 0.3998$	$- 0.6984$	$+ 0.4659$	$- 0.098$	$+ 0.054$	.
32	26	$- 0.4026$	$- 0.6906$	$+ 0.4777$	$- 0.301$	$- 0.143$	.
33	27	$- 0.4053$	$- 0.6826$	$+ 0.4895$	$- 0.158$	$+ 0.007$	.
34	28	$- 0.4081$	$- 0.6745$	$+ 0.5010$	$- 0.239$	$- 0.067$	.
35	30	$- 0.4135$	$- 0.6576$	$+ 0.5237$	$- 0.249$	$- 0.065$	.
36	June 26	$- 0.4874$	$- 0.3680$	$+ 0.7633$	$- 0.292$	$+ 0.037$	.
37	28	$- 0.4928$	$- 0.3428$	$+ 0.7753$	$- 0.423$	$- 0.061$	$\frac{1}{2}$
38	July 1	$- 0.5010$	$- 0.3045$	$+ 0.7917$	$- 0.342$	$+ 0.006$	.
39	2	$- 0.5037$	$- 0.2916$	$+ 0.7967$	$- 0.297$	$+ 0.054$	.
40	19	$- 0.5505$	$- 0.0598$	$+ 0.8473$	$- 0.538$	$- 0.139$	.
41	21	$- 0.5560$	$- 0.0320$	$+ 0.8487$	$- 0.340$	$+ 0.063$	.
42	23	$- 0.5615$	$- 0.0044$	$+ 0.8492$	$- 0.287$	$+ 0.119$	.
43	24	$- 0.5641$	$+ 0.0095$	$+ 0.8491$	$- 0.373$	$+ 0.034$	.
44	25	$- 0.5668$	$+ 0.0234$	$+ 0.8487$	$- 0.408$	0.000	.
45	28	$- 0.5752$	$+ 0.0653$	$+ 0.8461$	$- 0.382$	$+ 0.029$	.
46	Aug. 22	$- 0.6433$	$+ 0.3976$	$+ 0.7434$	$- 0.411$	$- 0.016$	.
47	23	$- 0.6459$	$+ 0.4090$	$+ 0.7370$	$- 0.411$	$- 0.017$	.

61² Cygni—Continued.

No.	Date.	Equations.	Residuals.	Wt.
	1881.			
48	Aug. 24	$x - 0.6486y + 0.4213z + 0.7297u - 0.386 = 0$	+ 0.005	1
49	25	$- 0.6513 + 0.4332 + 0.7224 - 0.378$	+ 0.015	.
50	26	$- 0.6541 + 0.4453 + 0.7147 - 0.372$	+ 0.014	.
51	Sept. 5	$- 0.6816 + 0.5588 + 0.6265 - 0.403$	- 0.048	.
52	6	$- 0.6841 + 0.5683 + 0.6176 - 0.352$	0.000	.
53	24	$- 0.7332 + 0.7264 + 0.4149 - 0.275$	- 0.003	.
54	26	$- 0.7386 + 0.7401 + 0.3896 - 0.379$	- 0.118	.
55	27	$- 0.7417 + 0.7474 + 0.3753 - 0.283$	- 0.027	.
56	29	$- 0.7471 + 0.7598 + 0.3492 - 0.315$	- 0.070	.
57	Oct. 22	$- 0.8100 + 0.8356 + 0.0282 - 0.041$	+ 0.062	.
58	26	$- 0.8210 + 0.8355 - 0.0297 - 0.025$	+ 0.051	.
59	27	$- 0.8237 + 0.8349 - 0.0442 - 0.052$	+ 0.017	.
60	Nov. 4	$- 0.8455 + 0.8206 - 0.1587 + 0.092$	+ 0.107	.
61	5	$- 0.8483 + 0.8177 - 0.1729 - 0.085$	- 0.077	.
62	29	$- 0.9138 + 0.6747 - 0.4868 + 0.229$	+ 0.080	.
63	Dec. 1	$- 0.9192 + 0.6568 - 0.5098 + 0.064$	- 0.096	.
64	4	$- 0.9273 + 0.6287 - 0.5430 + 0.238$	+ 0.060	.
65	5	$- 0.9302 + 0.6186 - 0.5540 + 0.225$	+ 0.041	.
66	7	$- 0.9377 + 0.5984 - 0.5750 + 0.111$	- 0.084	.

Reducing these equations by the method of least squares, we have the following systems of normal equations:

 α Lyræ, A.

$$\begin{aligned}
 + 69.0000 x + 5.2625 y - 3.7646 z + 17.3642 u - 6.4710 &= 0 \\
 + 9.3897 y + 5.9664 z + 3.9279 u - 0.5670 &= 0 \\
 + 22.2484 z - 3.6682 u + 0.6975 &= 0 \\
 + 31.9473 u - 5.7437 &= 0
 \end{aligned}$$

The sums of the coefficients of the four unknown quantities were used as a check in this part of the work, and denoting the sum of the coefficients in the normal equations by Σ , the reduction gave,

$$\begin{aligned}
 [as] &= + 87.8621: & [bs] &= + 24.5462: \\
 \Sigma a &= + 87.8621: & \Sigma b &= + 24.5465: \\
 [cs] &= + 20.7826: & [ds] &= + 49.5721: \\
 \Sigma c &= + 20.7820: & \Sigma d &= + 49.5712: \\
 [ns] &= - 12.0834: \\
 \Sigma n &= - 12.0842:
 \end{aligned}$$

The values of Σ were used in the elimination. From the solution of the normal equations we have

$$\begin{array}{ll} x = +0.0593 \pm 0.00510 & \text{weight} = 57.5209 \\ y = -0.0491 \pm 0.01484 & \text{"} = 6.7960 \\ z = +0.0175 \pm 0.00940 & \text{"} = 16.9264 \\ u = +0.1556 \pm 0.00764 & \text{"} = 25.6622 \end{array}$$

The residuals found by substituting these values of the unknown quantities in the equations of condition are given in the fourth column of the equations. The sum of the squares of these residuals is

$$0''.21300$$

By elimination we have

$$[nn.4] = 0''.21386$$

The probable error of an equation of weight unity is therefore

$$r_1 = \pm 0''.03869$$

The value of this quantity, found from the discordances of the single nights, is

$$\pm \frac{0''.07365}{\sqrt{10}} = \pm 0''.02329$$

The probable error found from the equations of condition depends on a greater variety of circumstances, and generally it will be the greater of the two. In the present case, however, the difference is not great, and we may infer from this that the observer's manner of bisecting these stars did not change much during the period of observation.

α Lyræ, B.

$$\begin{array}{l} +58.0000x + 1.6248y - 3.8841z + 12.7690u - 2.9620 = 0 \\ +7.2177y + 5.9363z + 1.3608u + 0.0436 = 0 \\ +19.2877z - 2.3489u + 0.9463 = 0 \\ +26.2358u - 5.5042 = 0 \\ [as] = +68.5097 \quad [bs] = +16.1409 \\ \Sigma a = +68.5097 \quad \Sigma b = +16.1396 \\ [cs] = +18.9918 \quad [ds] = +38.0171 \\ \Sigma c = +18.9910 \quad \Sigma d = +38.0167 \\ [ns] = -7.4760 \\ \Sigma n = -7.4763 \end{array}$$

The values of the unknown quantities are—

$$\begin{array}{ll} x = +0.0056 \pm 0.00556 & \text{weight} = 50.7511 \\ y = -0.0374 \pm 0.01741 & \text{"} = 5.1589 \\ z = -0.0111 \pm 0.01069 & \text{"} = 13.6974 \\ u = +0.2080 \pm 0.00827 & \text{"} = 22.8916 \end{array}$$

The sum of the squares of the residuals is

$$0''.18490$$

From the elimination

$$[nn.4] = 0''.18556.$$

Hence the probable error of an equation of weight unity is

$$r_1 = \pm 0.03955$$

The value found from the single nights is

$$\pm \frac{0''.07732}{\sqrt{10}} = \pm 0''.02445$$

The values of the annual parallax of α *Lyrae* found from the two series of observations are therefore—

$$\begin{array}{l} \text{Illumination A, } \pi = 0.1556 \pm 0.00764 \\ \text{" B, } \pi = 0.2080 \pm 0.00827 \end{array}$$

In such a case as this it is generally better to take the simple arithmetical mean of the two values, but as the weights do not differ much I have taken the mean by weight, and we have as the final result:

$$\pi = 0''.1797 \pm 0''.005612$$

The time required for light to pass from this star to our sun is 18.11 Julian years.

If we apply the corrections to the assumed values of $\Delta\delta$, we have for 1881.0:

$$\begin{array}{l} \text{Ill. A, } \Delta\delta = -44.259 \pm 0.0051 \\ \text{Ill. B, } \Delta\delta = -44.306 \pm 0.0056 \end{array}$$

These results indicate that the difference of declination was measured a little greater with the bright wires than with the dark ones.

The values of y , the correction to the assumed value of the proper motion have the same sign, but they have small weights, the interval of time being too small for an accurate correction of this constant. The values of z have opposite signs, and are of no importance.

61² *Cygni*.

The 66 equations of condition of this star give the following normal equations:

$$\begin{array}{rcl} + 64.0000x - 25.9116y + 7.6854z + 3.5760u - 1.3940 & = & 0 \\ + 17.6961y - 5.3082z - 6.6255u + 3.8300 & = & 0 \\ + 24.2231z - 2.8108u - 0.8082 & = & 0 \\ + 20.5718u - 9.9808 & = & 0 \end{array}$$

$$\begin{aligned} [as] &= + 49.3498 & [bs] &= - 20.1500 \\ \Sigma a &= + 49.3498 & \Sigma b &= - 20.1492 \end{aligned}$$

$$\begin{aligned} [cs] &= + 23.7889 & [ds] &= + 14.7109 \\ \Sigma c &= + 23.7895 & \Sigma d &= + 14.7115 \end{aligned}$$

$$\begin{aligned} [ns] &= + 8.3529 \\ \Sigma n &= - 8.3530 \end{aligned}$$

The values of the unknown quantities are :

$$\begin{aligned} x &= -0.0470 \pm 0.01121 & \text{weight} &= 23.7093 \\ y &= -0.0835 \pm 0.02330 & \text{"} &= 5.4890 \\ z &= +0.0821 \pm 0.01184 & \text{"} &= 21.2360 \\ u &= +0.4783 \pm 0.01381 & \text{"} &= 15.6253 \end{aligned}$$

The sum of the squares of the residuals is

$$0''.39331$$

and from the elimination,

$$[nn.4] = 0''.39287$$

The probable error of an equation of weight unity is

$$r_1 = \pm 0''.05458$$

The value found from the measurements of the single nights is

$$\pm \frac{0''.08114}{\sqrt{10}} = \pm 0''.2566$$

The discordance between the two values of the probable error is greater than for α Lyræ; and this might have been expected, I think, for the reason mentioned before. For the parallax of this star we have,

$$\pi = 0''.4783 \pm 0''.01381$$

The time required for light to pass from this star to our sun is 6.803 Julian years.

The value of x gives for 1881.0

$$\Delta\delta = -198''.513 \pm 0''.0112$$

The unequal distribution of the observations with respect to the epoch has diminished the weight of this determination of x . The values of y and z are greater than those found from the observations of α Lyræ, but it is doubtful if these corrections have any real significance.

An examination of the columns of residuals shows that the observations of α Lyræ are represented in a satisfactory manner. For the field illumination the greatest residual

is $0''.120$; and for the illuminated wires it is $0''.160$. The image of this star in our telescope is always surrounded with a mass of blue light, but in good seeing the central image is a small, round disk, that can be bisected with certainty. The observations of 61² *Cygni* show larger residuals, the greatest being $0''.209$. It is very rarely that this star is well defined in our telescope; and generally it has a hazy, indistinct appearance, that varies from night to night, and gives rise to some uncertainty in the bisections. If the objective and eye-piece be accurately focused on a star, and then a spectroscopie be placed at the eye-piece, the image of the star will be reduced to a fine line between the lines *D* and *E* of the spectrum. Towards the blue end of the spectrum the image of the star soon widens and flares out into a broad, fan-like shape; while towards the red end of the spectrum the image widens slowly for some distance, and gradually loses its fine sharp form. It is on account of this, I think, that stars of the color of 61² *Cygni* are not well defined by our glass. Still the error in the parallax arising from the bisections is not very great even in this case. It may be objected that the coefficient of temperature of the micrometer screw depends on too few observations, and this must be acknowledged. However, observations made since the close of the first series confirm the value of this coefficient already found, and I cannot doubt the reality of the result. Even if the value of this coefficient should be a little changed by future observations it may well be doubted whether the new coefficient should be applied to the preceding observations.

The parallaxes of stars found by the differential method, which has been used here, are relative, or they are the differences of the parallaxes of the two stars. In order to get the absolute parallax of the bright star, we must add to the parallax found by observation the parallax of the small star. This might be done by means of the table of parallaxes for stars of different magnitudes given by W. STRUVE in his "*Astronomie Stellaire*," p. 106. Although the assumptions made by STRUVE on the distribution of the stars in space seem plausible, yet this whole matter is so vague that I omit this reduction.

I am indebted to Prof. EDGAR FRISBY for assistance in all the preceding reductions. The important calculations have been made by us in duplicate, and independent checks have been employed when possible. I hope, therefore, that no important errors remain in the work.

OBSERVATIONS OF α Lyræ
WITH
THE PRIME VERTICAL TRANSIT INSTRUMENT.
1862-1867.

These observations form the most accurate determinations of declination ever made at the Naval Observatory, and having been undertaken for the purpose of finding the annual parallax of the star, as well as the correction of certain astronomical constants, I have examined the observations and their reduction in the hope that some valuable result might be deduced from this laborious work. Before beginning the observations special precautions were taken that this instrument should be in perfect order: its pivots were reground, and a new striding level was made by Mr. WÜRDEMANN. The methods of observing and reducing seem to have been chosen by Prof. J. S. HUBBARD, all the formulæ for the reductions having been written out by him, and the early reductions being in his handwriting. The method followed in the observations was the same as that employed by W. STRUVE with such success at Pulkova. Two systems of wires, seven in each set, were placed on each side the center of the field, and the instrument was reversed in each vertical, so that after a complete observation it was restored to its first position. The four transits observed over each wire gave a determination of the declination of the star, and in the reductions the observations of each wire were reduced separately. The reduction of the star's declination, from apparent to mean place, was computed directly from the formulæ for every tenth day, and then interpolated for the time of its culmination.

The following is an outline of this work:

The instrument was in charge of Professor HUBBARD from March 25, 1862, until his death, August 12, 1863. From that time until the end of the observations, April 2, 1867, it was in charge of Prof. S. NEWCOMB. Professor HUBBARD was assisted by Professors NEWCOMB and HARKNESS, and Professor NEWCOMB by Professor HARKNESS until November 8, 1865. After that time I was his assistant. The observations are distributed among these observers as follows:

J. S. HUBBARD, March 25, 1862-July 8, 1863, 93 observations.

S. NEWCOMB, May 6, 1862-February 26, 1867, 180 observations.

W. HARKNESS, August 12, 1862-August 16, 1865, 74 observations.

A. HALL, November 8, 1865-April 2, 1867, 82 observations.

The reductions of the transits from which the apparent declination of the star was found were made by the following computers:

J. S. HUBBARD reduced 119 observations.

S. NEWCOMB reduced 118 observations.

M. H. DOOLITTLE reduced 66 observations.

A. HALL reduced 108 observations.

The computations for the reduction of the star from its apparent to its mean declination were made as follows:

J. S. HUBBARD, March 10, 1862–January 27, 1864.

S. NEWCOMB, January 27, 1864–September 30, 1865.

A. HALL, September 30, 1865–January 2, 1869.

In my examination of these observations I first made a careful comparison of the formulæ used for the reduction to mean place, thinking that possibly some small error had been made in some of the periodical terms. No such error could be found. This examination was repeated by Professor FRISBY, who could detect no error in these formulæ. An independent check on these reductions was found by comparing with the Nautical Almanac. The reduction of the separate wires was made after the manner of STRUVE, and this is so simple and so easily revised that it is hardly possible for a systematic error to remain in this part of the work. It appears then impossible to change the results of these observations, and they must stand as they are printed.

The observations were then divided according to the observers, but it was apparent that such a division would not help the matter. Indeed, if equations of condition should be formed in accordance with such a division, these equations in some cases would not be suitable for a good solution. I then divided the observations into groups according to the time, and the means of these groups were taken by Professor FRISBY. As these means show briefly and clearly the character of these observations they are given here. The columns give the Washington mean time of the mean of the observations, and the seconds of the mean declination of the star. This declination is referred to 1860.0 for the years 1862, 1863, and 1864, and for the other years to 1870.0.

The probable error of a declination from a single complete transit is $\pm 0''.141$. For his own work STRUVE found this error to be $\pm 0''.117$. Judging, therefore, from the accidental errors, these observations ought to give trustworthy results.

Washington Mean Time.	δ	Washington Mean Time.	δ	Washington Mean Time.	δ	Washington Mean Time.	δ
1862.	"	1863.	"	1864.	"	1866.	"
Apr. 1, 7432	20.206	June 14, 2569.	20.281	Oct. 21, 5200	20.270	Feb. 19, 4692	51.413
Apr. 20, 4918	20.420	Sept. 12, 1299	20.397	Nov. 8, 3378	20.492	Mar. 10, 6370	51.407
May 9, 4732	20.228	Sept. 24, 6622	20.334	Nov. 27, 8843	20.484	Mar. 25, 5130	51.342
May 23, 2688	20.345	Oct. 12, 8859	20.270	Dec. 22, 3507	20.373	Apr. 12, 0497	51.333
June 11, 2169	20.128	Nov. 9, 6363	20.290			May 13, 3792	51.102
June 19, 3280	20.358	Nov. 20, 3570	20.288	1865.		May 24, 5985	51.295
June 29, 5002	20.336	Dec. 3, 9006	20.443	Jan. 11, 5335	51.391	June 20, 3586	51.193
July 18, 9469	20.168	Dec. 20, 8236	20.330	Feb. 12, 8735	51.350	July 3, 9879	51.348
Aug. 3, 4046	20.397			Mar. 7, 0129	51.214	July 13, 6614	51.346
Aug. 17, 8650	20.395	1864.		Mar. 23, 5177	50.932	July 27, 1675	51.350
Sept. 17, 2817	19.980	Jan. 15, 9520	20.320	May 15, 6717	51.230	Aug. 13, 1779	51.102
Oct. 6, 8282	20.082	Jan. 31, 7061	20.188	June 5, 2326	51.262	Aug. 24, 0980	51.155
Oct. 19, 2359	20.070	Feb. 26, 8367	19.908	June 27, 0063	51.268	Sept. 24, 5950	50.953
Oct. 26, 9731	20.168	Mar. 9, 0566	19.980	July 13, 4613	51.193	Oct. 5, 4320	51.016
Nov. 16, 9150	20.186	May 22, 4370	20.225	July 26, 7582	50.917	Oct. 18, 1971	51.148
Dec. 7, 8584	20.300	June 12, 4021	20.300	Aug. 10, 8834	50.792	Nov. 12, 9266	51.104
Dec. 20, 5237	20.160	June 25, 1084	20.140	Sept. 8, 0563	50.880	Dec. 5, 4632	51.192
		July 6, 8786	20.080	Oct. 27, 6705	51.042	Dec. 22, 3520	51.273
		July 16, 4524	20.140	Nov. 10, 9619	51.423		
1863.		July 27, 0235	20.244	Nov. 23, 6965	51.458	1867.	
Jan. 6, 7265	20.258	Aug. 8, 3897	20.238	Dec. 16, 6337	51.566	Jan. 13, 1590	51.504
Feb. 9, 0520	20.365	Aug. 26, 7394	20.262			Feb. 2, 0711	51.443
Mar. 8, 4105	20.288	Sept. 15, 2858	20.180	1866.		Mar. 10, 4054	51.180
Apr. 3, 2379	19.791	Oct. 8, 8879	20.273	Jan. 10, 7150	51.800		
May 10, 2565	19.932			Feb. 3, 4002	51.620		

The maximum effect of the parallax in declination will occur about June 27, and the minimum effect December 27. The values of δ show that a positive value of the parallax will result from the observations of 1862, but those of 1863, 1864, 1865, and 1866 will give a negative parallax; on the whole, therefore, a negative parallax would result. A curious diminution of the declination is shown in all the years during the first three or four months, and the different observers agree in this. Such a variation taken by itself would indicate a correction to the constant of aberration, but the fact of a negative parallax renders uncertain all deductions from these observations. Probably some annual disturbance in the observations or in the instrument occurred which will never be explained. A possible source of disturbance may be mentioned. At the time these observations were made the library of the Observatory was in a room adjoining the prime vertical room, and a stove, with pipe and chimney directly above it, was placed 20 feet south of the prime vertical pier. A fire was started in this stove in November, and kept going until April. It was assumed that the reversal of the instrument would eliminate the effects of the heat and smoke on the instrument and observations. But it would appear to be a doubtful policy to undertake a series of observations for the determination of the absolute parallax of a star, and for the correction of constants determined with the utmost care by STRUVE, under any other than the most favorable conditions. In view of the recent discussions on the constant of aberration, it would be an interesting and a valuable astronomical investigation to

determine the value of this constant in the latitude of our Observatory, and I hope our Prime Vertical Instrument may be refitted, and another and more successful attempt may be made.

MARCH 9, 1882.

P. S.—Having made some more observations of the stars in *h Persei* for testing the value of the temperature coefficient of the screw of the micrometer, the equations of condition resulting from these observations are given below. In the case of the observations made during the present summer double distances were measured on each night, so that the equations from these observations are of equal weight with those given before. The value of one revolution of the screw at the temperature of 50° is assumed to be $9''.9054$. The fourth decimal is the unit of the independent term.

Date.	Equations of Condition.				Residuals.
1880.					
Dec. 15-16	x	$- 12.9y$	$+ 41 = 0$	$+ 88.1$	
Dec. 18-20		$- 19.1$	$- 12$	$+ 59.4$	
1881.					
Jan. 14-17		$- 22.3$	$- 186$	$- 102.1$	
July 19-21		$+ 19.4$	$+ 37$	$- 42.6$	
July 23-24		$+ 19.3$	$+ 102$	$+ 22.8$	
July 25-28		$+ 20.0$	$+ 84$	$+ 2.1$	
Dec. 10-15		$- 16.6$	$- 13$	$+ 48.6$	
Dec. 16-17		$- 15.8$	$- 63$	$- 4.6$	
1882.					
Jan. 23-24		$- 31.6$	$- 182$	$- 61.6$	
July 28		$+ 21.2$	$+ 92$	$+ 5.4$	
July 29		$+ 23.7$	$+ 82$	$- 14.4$	
Aug. 14		$+ 23.7$	$+ 21$	$- 75.4$	
Aug. 19		$+ 15.3$	$+ 138$	$+ 74.5$	

The solution of these 13 equations by the method of least squares gives

$$y = -0''.00039205 \pm 0''.00005619$$

and the probable error of a single equation is $\pm 0''.004153$. The value of the revolution of the screw is therefore

$$R_{\theta} = R_0 - 0''.00039205 (\theta - 50^{\circ})$$

where θ is the temperature according to the Fahrenheit thermometer. This result differs but little from that found before, p. 46.

AUGUST 24, 1882.

